PERCEPTIONS OF A SELECT JURY OF OKLAHOMA STATE UNIVERSITY FACULTY REGARDING AGRICULTURAL RESEARCH NEEDS OF THE INTERNATIONAL CENTER OF TROPICAL AGRICULTURE IN COLOMBIA

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Special Dedication

With my deepest love and admiration I dedicate this work to my friend, professor and father:

Dr. Ulyses Jerry Grant

Dec. 31, 1920

to

November 1, 1987

Who taught me the two valuable lessons in life:

the importance of knowledge, education and agriculture

and

"always try to do your best, to be a professional always cost a little bit more".

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CHAPTER I

INTRODUCTION

Researchers in the agricultural field have proven and accepted that a steady increase in agricultural productivity through organized research and technological change is indispensable for sustained economic growth.

It is notable that an increment in productivity in the past 100 years has come largely from the application of scientifically based on-farm technology. Productivity has also been aided by changes in management due to the reviewing of past agricultural strategies through organized research evaluations. One of the most effective ways is by setting educational and research priorities.

Because most countries are now running out of good agricultural land, it is essential that agricultural research generate new technologies. These technologies should be in concordance with organized review programs that permit the evolution of higher yielding crops and livestock production. This is essential for the reduction of malnutrition as well as the avoidance of increased food costs, under sustained economic growth.

The task facing modern researchers during the past few decades was much more burdensome. Today, scientists deal

mainly with wider conditions and push productivities up to high yields to maintain food production at levels higher than the ever increasing growth population. Effective agricultural research must be accompanied by strong evaluation of their programs if production gains are to be achieved (CGIAR, 1980, 1990).

In the 1930's, average grain yields in the industrialized countries were approximately equal to those of developing countries (1.1 ton per hectare) and imports from developing countries to developed countries were in the order of 30 - 35 millions of tons.

By the 1970's, yields in the developing countries had increased to 1.5 tons, while production per hectare in industrialized countries had more than doubled, to 3 tons per hectare. During that decade the reverse was obvious; 38 million tons of grain were moved from the industrial nations to needy developing countries. In 1989 the gap is increasing even more. One hundred twenty three million tons are imported from developing countries to alleviate their hunger (Food Outlook, 1989).

While growth in yields reflects many social, economic, and ecological factors, the differences between the productivity of developed and developing countries can be attributed, at least in part, to the size and effectiveness of national agricultural research efforts and to well organized agricultural research programs among its institutions.

Under this context, agricultural research can be viewed simply as a systematic effort to develop new methods to increase agricultural productivity and/or technical efficiency.

It is useful to divide research activity into two functional components: science and technology. Science is taken to be research activity which results in the generation of knowledge with varying degrees of applicability to immediate problems. In contrast, the development of technology in agriculture is the research activity based on scientific knowledge that results in a mechanical, biological, or institutional innovation (Hayami and Ruttan, 1985).

Basic research is essentially the generation of knowledge, example of this is the research that is found in many of the Land Grant Universities across the United States.

Applied research, on the other hand, is more concerned with the generation of technology. Both basic and applied research, in practice, may be utilized in the resolution of a particular research problem.

These methods can include socio-economic research as well as conventional field and laboratory work by agricultural scientists.

The agricultural research that is needed in any particular country is determined, in part, by the unique soil, climate, social and other conditions that can be

found there.

The cost of research can sometimes be reduced by the transfer of technology from one country to another or from international centers to a national research system.

However, it is frequently difficult for the developing countries, the vast majority of which have tropical or subtropical climates, to gain effective transference of technology from the developed countries, which by contrast are largely temperate climates. Accordingly, the developing countries have particular research needs that must be met mainly through research carried out in the agro-climatic and socio-economic circumstances in which the resulting technology is to be employed.

In most countries, the agricultural community is composed of a large number of small producers, many of whom have relatively little economic or political power.

Individual producers do not undertake research because it is too expensive in relation to their operation and because any resulting benefits are likely to be widely shared and not captured by those who finance the research. Since the increased production from new technologies generally causes costs to decline, a substantial share of the long-term benefits of technological change goes eventually to consumers.

Because social benefits are potentially large and producers are frequently unwilling or unable to finance it, agricultural research in most developing countries is mainly

a public sector activity. How benefits are distributed among farmers and the extent to which they are shared by others depends largely on the characteristics of a country's research and dissemination efforts. If the main goal of agricultural research is greater output through increased productivity, the determination of research priorities and strategies is a relatively straight forward matter (Price 1984 and Gowder 1983).

Statement of the Problem

The impact of agricultural research on the world, its positive significance and the effectiveness of a well oriented research program are very obvious. However, what is not known are ways, needs and means to help establish research programs in developing countries and how to devise and carry out research activities which will result in greater output through increased productivity while focusing on needs.

The problem would seem to involve at least the following questions:

1. Is the research plan currently being developed so as to make the most effective use of the technology in addressing the actual problems and progress of developing countries?
2. Are the agricultural commodities programs (beans program, rice program, pasture program and cassava program) developing their respective strategy plans according to

the needs of developing countries? To what extent are the following considerations being emphasized?

a) Increased technical efficiency (e.g. increased crop production per hectare), b) change in the characteristics or composition of agricultural out-put (e.g. types of plants most suitable to mechanization and/or improved amino acid composition in the protein content of these crops, and c) reduced production risk (e.g. lessened variability in yields).

3. Are the future strategies in coordination with national agricultural program partners (e.g. national research and other international centers)?
4. Is this strategic plan developed within the continuity of the past program and does it have elasticity for improvements in future programs?

It seemed reasonable to assume that a determination of perceptions of a group of knowledgeable professionals as to the intent and focus of the programs of one well known research center in a developing country might provide some indication of the potential effectiveness of that center in addressing existing needs.

Purpose of the Study

The purpose of this study was to determine the perceptions of a group of Oklahoma State University professors from the fields of: agricultural economics, agricultural education, agronomy, forestry, biochemistry,

entomology, human nutrition and animal sciences with knowledge and/or experience in programs and agricultural development concerning the present strategic plan of an agricultural research center in Colombia, International Center for Tropical Agriculture (CIAT).

Objectives of the Study

The specific objectives of the study were to determine the perceptions of this group regarding selected aspects of the CIAT research programs including:

1. To determine selected demographic characteristics of respondents such as areas of international interest and experience, familiarity with CIAT and other international research centers, and knowledge of commodities with which CIAT deals.
2. To determine the relative importance of selected types of research for CIAT.
3. To determine the importance of CIAT being concerned with selected programs to develop technology without environmental degradation.
4. To determine the importance for CIAT of development of selected new activities, decentralization activities and education.
5. To determine the importance of short and long term goals of CIAT focusing attention on different groups of farmers in varying situations.
6. To determine the importance for CIAT to study selected

new commodities and to increase research efforts in selected additional areas.

7. To determine the importance for CIAT to increase selected institutions - building efforts.
8. To make recommendations for priority areas which may enhance the effectiveness of CIAT's 1990's programs.

Scope of the Study

The population of this study was limited to OSU faculty in the areas of agricultural education, agricultural economics, agronomy, animal science, forestry, biochemistry, human nutrition and entomology who had experiences or backgrounds in international agriculture.

For the purpose of this study this jury of OSU faculty was divided into five agricultural specialist categories in order to assess the various levels of professional and international experiences as follows:

Category 1. Agricultural economists with strong expertise in analyzing agriculture, pricing, resource planing, international trade, finance and agricultural policy making.

Category 2. Production/farm management economists with special skills in planning and assessing farming systems, research activities and agro-related businesses.

Category 3. Agricultural research administrator and senior level research scientist in the various

disciplines of soils, agronomy, plant breeding, livestock, seed production processing, irrigation, forestry and agriculture in general.

Category 4. Agricultural education and extension specialists in the area of training and information dissemination with expertise in assessing facilities for agriculture at various national levels.

Category 5. Social scientists with expertise in the change and adoption process specifically as applied to crop and livestock production.

The selected questions used in this study are not all of the inquiries that are pertinent to the needs of an international research center; however, the ones selected for this study were those believed most important by CIAT managers and the researcher. The findings of this study only represent the perceptions and opinions of this selected group and may not represent the perceptions and opinions of the Oklahoma State University, Division of Agriculture faculty.

Assumptions of the Study

The following assumptions were accepted with regard to this study:

1. The responses made by the selected jury of Oklahoma State University faculty will be accurate and

sincere.

2. The group of professors will indicate their perceived priorities for current and future programs in these identified program areas (bean, rice, pasture and cassava programs).
3. The Oklahoma State University faculty members surveyed were assumed to possess at least some level of awareness concerning the identified program areas of CIAT.
4. It is assumed that information obtained in this study will benefit functional personnel at CIAT, faculty at Oklahoma State University working mainly in international agriculture, and other international research institutions.

Definition of Terms

Some expressions used in this study are defined as follow:

Applied Research: This is the research done at the local experimental stations. Teams of scientists into the different sciences can test improved varieties of an specific crop and identify improved components that operational people can use to meet farmers' needs (Grant and Klatt, 1990).

Basic Research: This type of research is the support of all other categories research. Helping to the development of basic knowledge that won't have a predetermined use (Grant and Klatt, 1990).

CGIAR (Consultative Group on International Agricultural

Research): It was established in 1971 as an intermediary among governments, international organizations, national organizations and private foundations to support the international agricultural research system and its programs around the developing countries to reduce poverty (CGIAR, 1980).

CIAT (International Center for Tropical Agriculture): It is located in Palmira, Colombia. Its coverage is world wide in low land tropics of special importance in Latin America. This institution emphasizes research in beef, cassava, field beans, maize and rice (regional research station for CIMMYT and IRRI). It was established in 1968 by Dr. U. J. Grant.

CIP (International Potato Center): This institute was established in 1971 in Lima, Peru. One of CIP's major aims is to improve and develop species of Solanum (potato) in its high-altitude temperate lands in the Andes and for the low tropical regions, where it has high potential as low-cost staple (Hayami and Ruttan, 1985).

CIMMYT (International Maize and Wheat Improvement Center): This program was established in 1943 in Batan, Mexico, and extended as an international center in 1966 working with scientists and national program supporting research around developing countries on the improvement of maize and wheat as well as on barley and triticale (Grant and Klatt, 1990).

IBPGR (International Board for Plant Genetic Resources):

Headquartered at FAO in Rome, was established in 1974 by the CGIAR. Its main functions are to support a network of genetic resources for conservation, documentation, and use of plant germplasm providing genetic resources for future progress in plant improvement (Grant and Klatt, 1990).

ICARDA (International Center for Agricultural Research in the Dry Areas): It was established in 1976 in Aleppo, Siria. One of the main concerns of this center is research for the vast arid and semi-arid areas of North-Africa and West-Asia. Its main effort is the improvement of three principal groups of crops: basic cereals (wheat, barley and triticale), legumes (lentil, chick pea and faba) and forages (Grant and Klatt,1990).

ICRISAT (International Crops Research Institute for the Semi-Arid Tropics): It was established in 1972 in Hyderabad, India. Its main concern is to improve substantially the quantity of food production in the semi-arid tropics under poor farmer conditions with emphasis on cereals (sorghum and pearl millet) and peanuts (Grant and Klatt, 1990).

IFPRI (International Food Policy Research Institute): It was established in 1975 in Washington DC, USA. This institute was created in association with policy makers, research directors, and governments. Its main focus is political and economical issues to improve the equity of food distribution and food production. Its three prime factors are: food production and its effects on technological change, food distribution and consumption in regard to the

poorest nations, and international food trade (Hayami and Ruttan, 1985).

IITA (International Institute of Tropical Agriculture): It was established in 1967 in Ibadan, Nigeria. It was the first agricultural research center on the Africa countries with a worldwide research agricultural scope. At the beginning, its main efforts were on the low land tropics of Africa, and then its research has expanded to other countries and to sub-humid and semi-arid environments. Under CGIAR system, IITA's main worldwide responsibility is on cowpea, yam, cocoyam and sweet potato; and regional responsibility for cassava, rice, maize, soybean, lima bean, winge bean, pigeonpea and basic food crop improvement specially on root and tubers, cereals and grain legumes (Grant and Croy, 1989; and Grant and Klatt, 1990).

ILRAD (International Laboratory for Research on Animal Disease): It was established in 1974 in Nairobi, Kenya. Its main effort is to assist in development of effective control of two important livestock diseases: trypanosomiasis and theilerosis. These two diseases diminished livestock production in more than 50 developing countries in Africa, Central and South America, the Middle East, India, and Asia (Grant and Klatt, 1990).

ILCA (International Livestock Center for Africa): This center was established in 1974 in Addis Ababa, Ethiopia. Its main efforts are carrying out research and development on improved livestock production and marketing systems (Grant

and Klatt, 1990).

IRRI (International Rice Research Institute): This center was the first international center for agricultural research in the developing countries. It was established in 1960 in los Banos, Philippines. IRRI's major aims are to improve and develop rice under tropical conditions and to produce high-yielding and semi-dwarf rice varieties (Grant and Croy, 1989 and Klatt, 1990).

ISNAR (International Service for National Agricultural Research): This institute was established in 1980 in the Netherland. The main efforts of the institute is to assist in strengthening national agricultural research systems from developing countries. This institute is the youngest of the centers under the CGIAR system (Grant and Klatt, 1990).

On-Farm Research: Is the identification through experimentation on farms, of the combinations of agriculture and livestock production practices that will assure better productivity and profitability. This type of research should be conducted in farmers fields and should be formulated in agreement with the farmers conditions (Alexandratos, 1987).

Strategic Research: This type of research involves biological, chemical, physical or social sciences toward oriented problems affecting several areas of a country or a region of the world (Klatt, 1990)

WARDA (West Africa Rice Development Association): This center was established in 1971 in Monrovia, Liberia. The main role of this center is to promote regional cooperative

effort in adaptative rice research among fifteen countries with IITA and IRRI support (Grant and Klatt, 1990).

CHAPTER II

REVIEW OF LITERATURE

Introduction

The perception that technological change can be an efficient source of growth in traditional agriculture, while of relatively recent origin, has been a major factor in the notable increase of the agricultural research effort in developing countries for the past two decades.

A consequence of this is, for the first time in history, an emerging global agricultural research system that has as its primary focus increased food production for the developing countries (Bengtsson, 1983 and CGIAR, 1985).

This system, while deficient in some respects but, in general, well coordinated, is composed of several major parts. These include national research organizations in the developing countries, regional research programs in developing countries, international agricultural research centers and research organizations (including private firms in the high-income countries).

The purpose of this chapter is to present an overview of related research identified from selected literature relative to this study. The presentation of this review will be partitioned into several major areas and a summary presented

to facilitate organization and clarity.

Current Research

Mankind now has the capability, given the will, to meet food needs for two or three decades and, in doing so, to stimulate widespread economic and social development in agrarian areas wherever agricultural productivity remains low and static. Realization of such comprehensive progress will require proper and massive investment of men and money, organization or reorientation of a great number of activities; and coordination of effort of national and international agencies.

Mexico, with a population of 21 million and major food crop deficits a quarter century ago, is now in a surplus situation although its population has climbed to 47 million (Borlaug, 1965; Harrar, 1967; and Grant and Croy 1989). Mexico now is turning its attention to greater involvement of the large number of farmers with small land-holdings.

India, primarily through its "high-yielding varieties program", is now increasing both production and average yields of wheat, rice, corn, sorghum and millets (Subra manium, 1968; and Grant and Croy, 1989).

Pakistan, particularly the western wing, has made dramatic progress in the acceleration of output of wheat, rice and corn (Khuda Bakhash Bucha,1968; and Grant and Croy 1989).

Kenya has moved from a deficit to a surplus situation

with corn largely because of increased yield on small farms (Sprague, 1987).

Utilizing new varieties and other technology developed by the International Rice Research Institute, the Philippines produced a surplus of rice in 1968 (Romulo, 1968).

There are a few dramatic new developments involving uneducated farmers with small land holdings. In El Salvador, some 8000 farmers with small farms in the hill regions are now realizing corn yields three or four times greater than ever before and are overcoming a very serious hunger problem through both greater direct human consumption of cereals and by greater dependence on farm production of poultry and pork (CIMMYT, 1988).

In the vicinity of Porto Alegre in Brazil some 10,000 farmers are greatly accelerating output of the basic food crops.

In the Valley of Puebla in Mexico, through the combined efforts of the International Maize and Wheat Improvement Center and local agencies, corn yields on some farms have increased from a traditional average of 800 kilos per hectare to 4,000 kilos or more per hectare (CIMMYT, 1988).

Behind each of these examples of progress there has been a determined effort to bring science to bear in local problems. In each case, agricultural technology has been specifically and imaginatively tailored to local needs by public and international agencies. Behind each effort there have been men of vision and scientists of substantial

talent.

Before the author attempts to elaborate on the strictly agricultural problems facing Latin American countries, it is important to make certain assumptions.

First, there is an urgent need to rapidly accelerate food supply in the agrarian nations especially those with food deficits, particularly countries which already have very unfavorable man-land ratios. There are perhaps a dozen nations of substantial size and a number of smaller countries which fall into this category. Most are in the tropical or subtropical regions. Characteristically, their yields per unit area or per animal unit are low and static. Post increases in output have resulted primarily in Latin America and Africa (with the exception of Ethiopia), where increases in food are more easily achieved, more land is available and pressure on the land is not as great as in Asia and India. However, in these countries, the availability of institutions and trained people characteristically is inadequate for the complex task of development, so little time should be lost initiating needed agricultural programs (Grant and Croy, 1989).

Second, food production and stabilization of population growth rates must be attempted simultaneously. While the prospects are good that agricultural output can be substantially increased in the decades ahead, improvements in food supply and income per person can only occur if population growth rates are contained at, or reduced to,

levels which nations resources can support in comfort and dignity (Grant and Croy, 1989; and Grant and Klatt, 1990).

Third, in the poorer agrarian nations, agriculture is a basic industry and must be treated as such by the nations themselves and by assistance agencies. Millions of rural dwellers, many of whom have small acreage and still operate on the barter system, can and must be assisted by a well-organized research center in order to be able to increase their agricultural output and income and to participate in the market economy.

Fourth, improvement in the diets of most of the poorer people in the developing countries can occur only if their incomes are increased. The problem cannot be solved through gifts of food which only buy time and offer no permanent solution to the problem of hunger (Grant, 1986). Some farm dwellers could and should be assisted to grow a greater variety of products and this can be achieved only as well organized research programs are developed in their respective countries.

Increasing agricultural research in agrarian nations is a prerequisite to all other forms of economic and social development. Therefore, this must be given priority (both by nations and by outside assistance agencies) as much as that given with any other economic activity that will contribute an equal amount to income per dollar invested (Grant, 1986).

From Traditional To "Green Revolution"

This review is intended to aid in understanding the forces which permit crop and animal yields to move from traditionally low values to modern-day higher yields. It may be helpful to examine the factors which limit productivity under traditional systems, to recall the technical and other advances which now permit the elimination of such constraints, and to describe some characteristics of intensive agriculture.

As civilization spread and man started using new areas, he took with him the crops on which he had come to depend. In each new area his crop varieties were forced to become adapted, using the process of natural selection to a new type of soil properties, different day length or new environments. Particularly, they had to develop resistance to disease organisms or to insect pests peculiar to the new locality. With the evolution of varieties, each with specific adaptation to one of the multitude of specific sets of environmental conditions, there arose great diversity of germplasm.

Man aided in the elaboration of this diversity as he selected types which suited his own needs. This brought about the stabilization of specific grain, fruit or foliage characteristics. These combined forces contributed to the present day diversity of germplasm of which the 410,100 accession of wheat, 215,000 accession of rice, 1000 accession

of maize, among many other crops, are good examples (Plucknett, 1987).

Despite all the diversity which existed, there was little that a traditional farmer could do about improvement of yield by changing varieties. He/she could and did, over time, improve yields by some selection of his/her own by saving the better types or by changing his/her own variety with another in his/her locality that demonstrated greater resistance to disease or insect pests.

Though the great diversity of gene banks was of little benefit to traditional farmers, it now constitutes one of the world's important scientific resources. Even though most native types are adapted to conditions of low soil fertility, many of them do have resistance to specific insect pest or disease organisms or have plant characteristics useful in the development of high-yielding types (CGIAR, 1985).

Crops in traditional farming systems could be protected against the voracity of insect pest and diseases only through replacement of susceptible types by more resistant ones or by altering the date of planting in an attempt to escape heavy losses. However, there was only a little that poor farmers could do.

The power available on the traditional farm was limited to that of the farmer's own muscle plus that of his/her family and sometimes neighbors, supplemented in more advanced systems by that of farm animals. The limitation of power restricted the options of the farmers with respect to depth

of planting and amount of cultivation. It restricted the land area where other modes of power are not yet available. Most of the products were used for home consumption or for sale or trade for services or other products within the area of the farmer's mobility.

Traditional farming was and is a relatively simple matter, by modern standards. The production system involved man, his land, his seeds and his farm animals. There was little or no seed and little or no desire by farmers for intervention by either government or private industry.

Just in the last eight decades many scientific discoveries and innovations plus elaboration of business and organizational techniques have, if properly utilized, allowed drastic changes to occur in agricultural productivity.

With advances in chemistry, physics, engineering, agriculture, business and other fields, man has learned to manufacture fertilizers containing the major and minor nutrients required by particular crop plants and soil, and crop scientists have learned the symptoms of the efficiency or excess of individual plant's nutrients. Interactions among certain elements are now understood. Means of correcting soil acidity or alkalinity are known (CIAT, 1989, 1988, 1987).

According to Wortman (1978), fertilizer consumption on a world basis, not including mainland China, rose gradually from two million tons at the beginning of this century to four million tons before World War I and to nine millions

tons in 1938-39, and up to 80 millions tons during 1980-81 (Grigg, 1985).

The native varieties of most crops, having evolved over the years of natural selection on soil of low fertility and under conditions of minimum management, developed certain specific traits which made them unsuited for use in systems involving high level of fertilizers and intensive management. Many of these indigenous varieties generally are particularly efficient at extracting the limited quantities of nutrients from poor soils. The improved types also possess great plant vigor, a characteristic vital in agricultural systems where weed control is imperfect, if practiced at all.

During the last decades, scientists have learned through advances in genetics and plant physiology to design crop plants which are capable of converting high levels of applied fertilizers to harvestable product rather than excessive foliage, e.g. the semidwarf wheats from Mexico, (developed cooperatively by scientist of Mexico and the Rockefeller Foundation) and the dwarf tropical varieties of rice now produced by the International Rice Research Institute. Scientists have learned in the case of some crops to create varieties insensitive to day length, thereby greatly extending the range of latitudes at which they will grow and produce successfully (IRRN, 1987).

Plant pathologists and entomologists have learned the essential life cycle characteristics of many of the world's major disease organisms, insects and plants. Geneticists

have found breeding methods for rapidly tailoring crop plants for use in high fertility, intensive management systems, and even for sophisticated mechanical harvest.

It is now possible to create high-yielding varieties of crops anywhere in the world, given the availability of interested and capable plant scientists and the continued support of their work. The farmer can be emancipated from the restrictions on yield imposed by his native varieties but, to do so, a massive and well-directed effort is needed in the public and international research sector around the world (CGIAR, 1985).

According to Arnon (1981), in the highly developed nations, including those in North America and Europe, the process of change has occurred relatively fast with considerable acceleration since World War II in fertilizers, specific plant protectors and high-yielding varieties. Concurrently, there was a substantial improvement in the level of education of farmers and in communication systems for transmitting knowledge to them.

Researchers vary in their concepts of intensive or modern farming. In the industrialized nations, the degree of modernization is determined not only by yield level attained but also by output per unit of human time. Thus, in modern countries, the degree of mechanization becomes an important criteria.

According to Nortman (1976), the intensification of agriculture is a complex and sophisticated matter requiring

the intervention of new sets of well-prepared individuals and organized institutions not particularly involved in the affair of the subsistence farmer. Scientists, working primarily in the public sector, must develop the new varieties, the fertilizer-use practices, the means of disease control and the crop and animal management practices. For maximum benefits and often for any benefit at all, changes must be introduced.

In traditional agriculture the farmer and his/her family essentially control the whole production system and farmers themselves must demonstrate their willingness to change. If, by any chance, agricultural research fails in its contribution, then, intensification ceases; and this system can be easily recognized in the farmer organizations mainly in the developing countries. To the contrary, if agriculture research has success, the system will have quick acceptance. So, early success is very important to achieve, if positive results are desired.

As an answer to the needed change and for visible solutions to the problems that traditional agriculture brings, "The Green Revolution" was one of the responses. In an attempt to bring a rapid change and quick acceptance to overcome food deficits, private foundations and governments from both underdeveloped and developed countries turned to agriculture assistance by the modernization of agricultural practices and tools in the least developed countries. As a result "The Green Revolution" was initiated, and to some

extent, this revolutionary agriculture started breaking traditional practices (Mellor and Riely, 1989).

The importance of "The Green Revolution" was recognized by Mellor and Riely (1989) when they wrote:

> The Green Revolution is generally given credit for releasing many in the third world from poverty and hunger. Traditional agricultural practices in a number of developing countries have been transformed by the planting of high-yielding duarf varieties of rice and wheat, the expansion of irrigation, and the increased use of chemical pesticides and fertilizers. Since international agriculture research centers introduced the "Green Revolution" technologies in the mid-1960, those technologies have helped to shift the balance in the Malthusian race between population growth and food supplies increasing the productivity of land and labor through higher-yields. (p.66).

The simple meaning that "Green Revolution" can have is that the transfer and adaptation of modern agricultural practices can be used in the least-developed countries.

One of the problems of the developing countries is the low yield in commodities such as grains. One of the main goals of agricultural assistance is to increase the yields of grains such as wheat, rice and corn (Stevens and Jabara, 1988).

Scientific advances in high-yielding grains resulted at the International Rice Research Institute (IRRI) in the Philippines, the International Center for the Improvement of Maize and Wheat (CIMMYT) in Mexico, and the International Center for Tropical Agriculture (CIAT) in Colombia. Initially, support for these centers came primarily from the Ford and Rockefeller Foundations. Similar centers of

agricultural research, now supported by a number of nations as well as foundations, are administrated by the Consultative Group on International Agricultural Research (CGIAR). Ten more international centers have subsequently been established. These research centers are located in the tropics and their major efforts have been expanded to include food commodities such as potatoes, cassava, beef, grasses, and various other legumes in addition to the major grains (CGIAR, 1985).

There is no doubt of the positive effects that the "Green Revolution" brought to the least-developed countries and it seems that where this agricultural revolution was not introduced it has not been conceivable to balance the population forces. Also, it is obvious that the responsibility of today's scientists in developing countries is more laborious than that of the researchers during the 1970's. At that time the task was to demonstrate that yields, starting from practically none to a low level of fertilization, could be increased substantially just with appropriate conditions of better fertilization practices, water control and some control of diseases and pests.

Today, researchers must consider the levels of production achieved up to this time and push the yield up substantially, even extremely in many cases. Scientists must take into consideration the environmental impacts such as: excessive deforestation, species in extinction, misuse of chemical inputs, inappropriate land use, inappropriate

cultural practices, excessive genetic uniformity of improved varieties and germplasm conservation among other conditions of poverty and technology.

Mellor and Riely (1989) point out that new scientific techniques must be used in tissue culture and recombinant DNA. For example, using them, the opportunity to extend the productiveness of agricultural research is even greater. In this way, the new high yield varieties can be produced inexpensively or in a short time.

Pat and Silveira (1985) reaffirm that the identification of real needs is the starting point for a better use of revolutionary agriculture, particularly in the least developed countries in which no data exist on the improvement and potential of agriculture.

Summary

Agriculture is the main economic sector of the least developed countries and most of the farmers in these countries are producing at marginal level. One of the characteristics of subsistence agriculture is always human poverty as a result of low agriculture production. Because of the population boom, labor is generally in excess of productive work opportunities in agriculture. These factors create an endless circle. As a result, countries in which the majority of the population is engaged in subsistence agriculture and which have no other resources are inevitably poor and their economies remain low.

Facts have shown that overall development is not likely to occur unless agricultural productivity is increased. The transition from traditional agriculture to modern agriculture cannot occur without some form of intervention from outside which provide the incentives and the means to make "agricultural growth" possible. But, even where these special conditions for "agricultural growth" are created, the modernization process is generally difficult. If efforts to transform subsistence agriculture are to be implemented, several selected functions have to be successfully developed:

a) new technology and research have to be generated, implying an effective research organization (national and/or international).
b) The new technology has to be rapidly transferred to the farmers, requiring an efficient systems of research/extension/education.
c) Appropriate strategy and needs assessment for promoting the entire process must be devised and implemented.

CHAPTER III

METHODOLOGY

This chapter is designed to deal with the population for the study, the development of the questionnaire, the handling and administering of the questionnaire and treatment of the data.

Population for the Study

The study population included five different categories of agricultural professors presently serving at Oklahoma State University.

Oklahoma State University contains over two hundred full time faculty members within the division of agriculture. Of these two hundred faculty members, over forty percent have had some degree of international experience in the developing countries. This fact makes OSU a technical support institution for evaluation and response to any type of request for assistance in the area of international research within the agricultural field.

It was determined that as many professors as possible that fulfill the specifications of each category should participate in the study. Then, in order to complement and have a better perception of international agriculture, a list

of professors with the specified backgrounds and international experience was collected from the office of the Assistant Dean for International Programs in Agriculture. Once the list of professors with international experience and field of work was completed, the different categories were implemented according to the needs and goals of the study.

The following list, grouped by five categories of specialists, is a sample of some of the professional capabilities available at OSU. These data provide a sample from which the quality of faculty available for this work is assessed for various levels of professional and international experience.

The actual number of this sample population was 30 faculty members with international experience in developing countries.

Specialists Categories:

Category 1. Agriculture economists with strong expertise in analyzing agriculture, pricing, resource planning, international trade, finance and agricultural policy making. Within this particular category, three professors from agricultural economics, two from animal science and one from agronomy (International Agricultural Assistant Dean) qualified.

Category 2. Production/farm management economists or agronomists with special skills in planning and

assessing farming systems, research activities and agro-related business. There were within this category three professors from the agricultural economics and agronomy departments.

Category 3. Agriculture research administrator and senior level research scientists in the various disciplines of soils, agronomy, plant breeding, livestock, seed production processing, irrigation, forestry and agriculture in general were contacted. According to their experience and background, three professors from animal science, one from entomology and one from forestry were the most indicated to fulfill this category.

Category 4. Agricultural education and extension specialists in the area of training and information dissemination with expertise in assessing facilities for agriculture at various national levels were qualified. From this category, four professors were active members of the agricultural education department, one was from the economy and one was from the agronomy department.

Category 5. Human nutrition scientists and social scientists with expertise in the change and adoption process, specifically as applied to new technologies, environmental problems and its

impact on humans and production were considered. The respondents of this category were selected as follow: two from biochemistry, two from human nutrition, one from entomology and one from forestry.

Development of the Instrument and Administration

A questionnaire, administered by means of a personal visit by the researcher, was chosen in this study. This approach was felt to be propitious due to its moderate cost and confidentiality.

TABLE I

POPULATION

Response Groups	Sample Size	Sample % of Population	Rate % of Responses
Category 1	6	20	100
Category 2	6	20	100
Category 3	6	20	100
Category 4	6	20	100
Category 5	6	20	100
Total	30	100	100

The questionnaire was developed by the researcher. The questions and statements were suggested through a consultation with CIAT's Directors (Dr. J. L. Nickel, Dr. G. Brekelbaum and Dr. J. A. Cuellar), other research members of the institution and other retired members living in the USA. Then it was reviewed by the members of the advisory committee, OSU International Agriculture Assistant Dean, and by Emeritus Professor Dr. R. Price. It was pre-tested in a pilot test by the distribution of copies to 8 students in the International Research Class offered at OSU. The questionnaire was then revised using the recommendations made by the pilot test and agricultural education professors.

The corrected questionnaire with 80 important statements was divided into two different sections. The first section was designed to deal with relative importance in a) selected areas, mainly basic research, strategy research, adaptative research and applied research; b) judgments of CIAT concerning priorities and c) judgments in CIAT's different research activities mainly in communications, activities, decentralization and educational research. The second section was designed to determine perceptions as priority areas for CIAT's 1990's program.

Data Treatment

Answers given by each respondent for each question on the instrument schedule were summarized and scored where

appropriate. From the latter means, standard deviation and frequencies were calculated. There were three sections in the questionnaire. The first section contained questions meant to obtain the international experience of the faculty members and (questions related to the department), number of years associated with this department, major area of interest, international experience, familiarity with CIAT's program and familiarity with other international programs. The data obtained were displayed in tables utilizing frequencies, standard deviations and percentages to describe the respondent group.

To obtain perceptions of the respondents, Likert-type scales were used in part two and three of the questionnaire. The categories and numerical values assigned to each on this scale ranged from: "Not Important" for CIAT's program, (value of none); "Slightly Important" (value of 1); "Moderately Important" (value of 2), "Very Important" (value of 3) and "Essential" (value of 4). These scale numerical values and the range of numerical limits for each of the categories are displayed in Table II.

Data resulting from the study were tabulated and analyzed using the SYSTAT computer program. This program involves frequencies, percentages, standard deviation and means.

TABLE II

VALUES AND ABSOLUTE NUMERICAL LIMITS FOR RESPONSE CATEGORIES

Response Categories	Scale Numerical Value	Range of Numerical Limits for Categories
Not Important for CIAT's program Not Knowledgeable	None	0.00 - 0.49
Slightly Important Slightly Knowledgeable	1	0.50 - 1.49
Moderately Important Moderate Knowledgeable	2	1.50 - 2.49
Very Important Knowledgeable	3	2.50 - 3.49
Essential Knowledgeable	4	3.50 - 4.00

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

The objective of this chapter is to present the perceptions of a select group of Oklahoma State University faculty with international experience. These perceptions were intended to help develop a strategy that might improve CIAT's 1990's research program.

This chapter describes and analyzes collected data in keeping with the objectives previously outlined in this study. Thus, this chapter reports the recommendation of OSU faculty by describing and analyzing the collected data.

Population of the Study and Findings

The population in this study consisted of 30 faculty members with international experience from the Oklahoma State University College of Agriculture.

The sample was divided into five different categories according to their experience and field of study. All the faculty in the different groups fit within population parameters. Since the author was present while the faculty answered the questionnaire, returns were 100%.

TABLE III

DISTRIBUTION OF RESPONDENTS BY DEPARTMENT
N = 30

DEPARTMENT	NO. OF RESPONDENTS
Agricultural Education	4
Agricultural Economics	7
Agronomy	6
Animal Science	5
Biochemistry	2
Entomology	2
Forestry	2
Human Nutrition	2
Total	30

The 30 faculty members came from 8 different departments within the College of Agriculture. The departments were represented by seven professors from agricultural economics, six professors from agronomy, five professors from animal science, five professors from agricultural education and two professors from biochemistry, entomology, forestry and human nutrition respectively as shown in table III. The percentage

breakdown is as follows: agricultural education 13.3%, agricultural economics 23.3%, agronomy and Assistant Dean of International Program 20.0%, animal science 16.7%, biochemistry 6.7%, entomology 6.7%, forestry 6.7% and human nutrition 6.7% as indicated by data shown in Figure 1.

The years of experience that each professor had within his/her department are presented in Table IV. These responses reveal that the range for years of experience within their department was between 0.5 and 42 years. A mean of 12.42 years evidenced the average degree of experience of this selected group of OSU professors.

In response to the question concerned with international experience in agriculture, the largest portion of faculty (32.42%) was most familiar with agriculture in South America, followed by 29.72% in Central America, 20.30% in Africa and 13.0% in Asia, as shown in Figure 2. No one responded as having had agricultural experience in other parts of the world.

The survey instrument asked each faculty to respond as to what extent they are acquainted with the work being accomplished by the International Center of Tropical Agriculture. As shown in Figure 3, no one (0%) indicated "yes, I know fully", 80% replied "yes, I Am Somewhat Knowledgeable", 16.7% answered "Yes, Only Very Little" and 3.3% said "No, I Am Not Knowledgeable" .

FIGURE 1

RESPONSES DISTRIBUTION BY DEPARTMENT

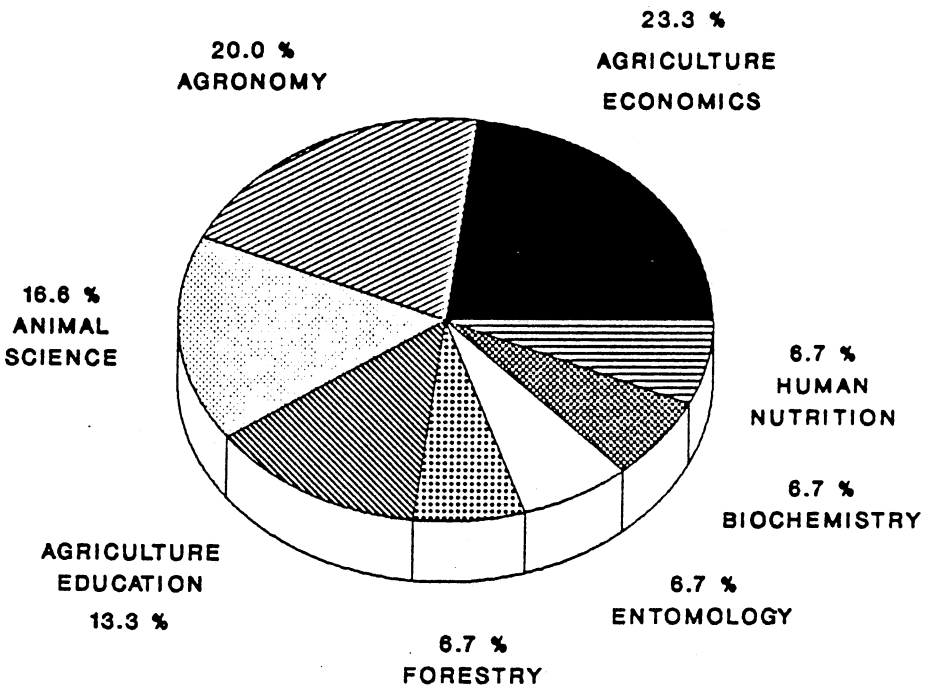


TABLE IV

OSU PROFESSORS' YEARS OF EXPERIENCE
ASSOCIATED WITH THEIR RESPECTIVE DEPARTMENT

NUMBER OF YEARS	FREQUENCY	PERCENT
0.5	1	3.3
2.0	2	6.7
4.0	1	3.3
5.0	2	6.7
7.0	1	3.3
8.0	2	6.7
9.0	3	10.0
10.0	2	6.7
11.0	3	10.0
12.0	5	16.7
14.0	1	3.3
15.0	1	3.3
17.0	1	3.3
20.0	1	3.3
22.0	1	3.3
27.0	1	3.3
34.0	1	3.3
42.0	1	3.3

N = 30
AVERAGE = 12.42
STANDARD DEVIATION = 9.1
MINIMUM NUMBER OF YEARS = 0.5
MAXIMUM NUMBER OF YEARS = 42.0

FIGURE 2

INTERNATIONAL AGRICULTURE EXPERIENCES OF OSU FACULTY RESPONDENTS

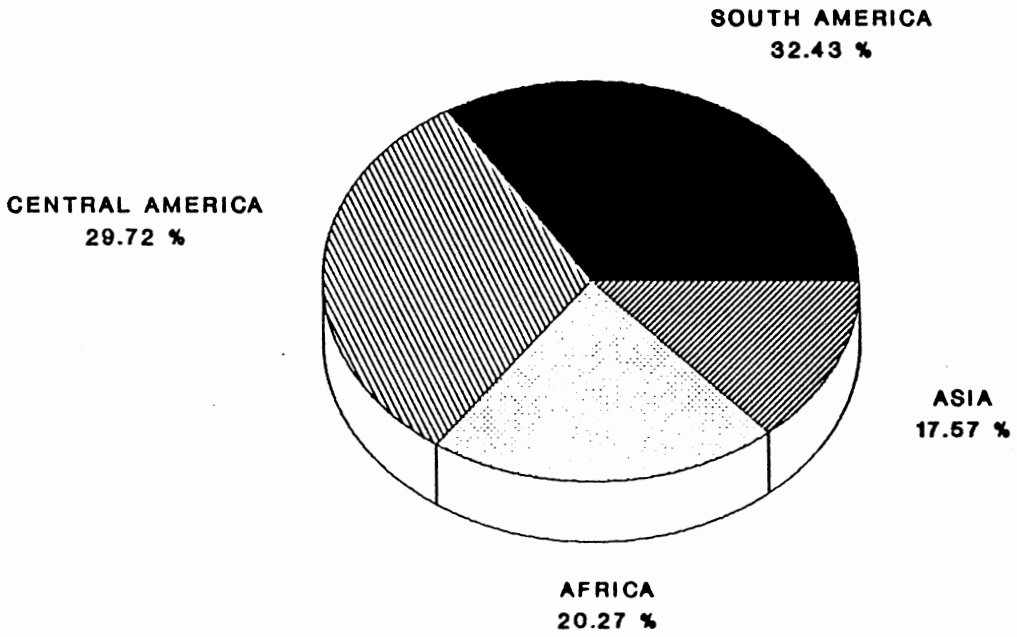
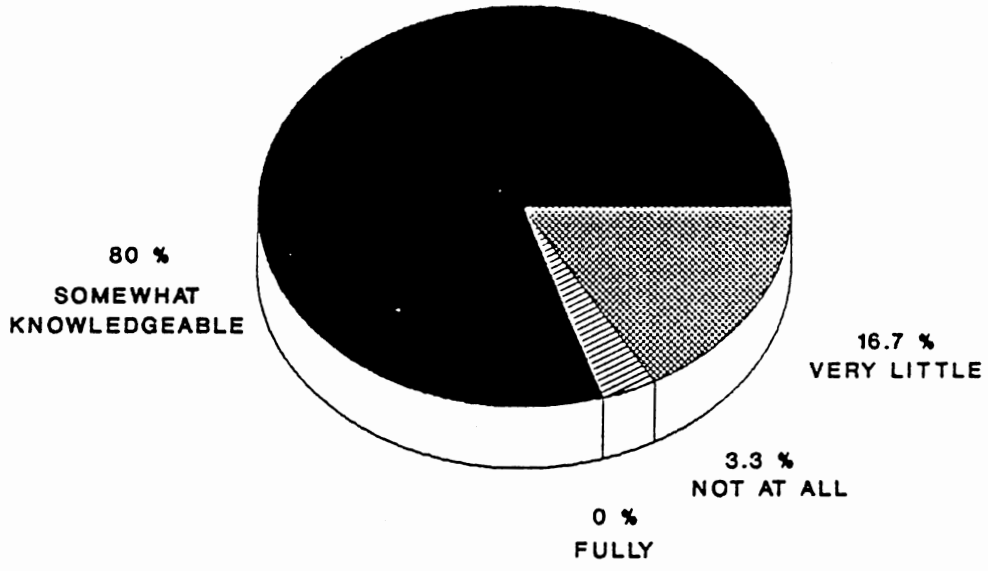


FIGURE 3

GROUP OF OSU PROFESSORS FAMILIARITY
WITH WORK ACCOMPLISHED BY CIAT



Findings presented in Table V show responses by the OSU group of professors regarding their familiarity with the work of other international programs. When compared as a total group, it was found that 10 (33.3%) of the respondents were familiar with WARDA. One half of categories two and three knew of this agency, while 33.3% of categories one and four had this knowledge. None of those in category five were familiar with this center. For the ILRAD center, over 53% of the respondents indicated familiarity. Over two-thirds of category three respondents knew of this center with 50% of the other groups being familiar. More than 46% of the respondents indicated being familiar with IITA. Over 66% of those in category one knew of this program while this was the case for 50% of categories two and five and 33% of categories three and four. Regarding IBPGR, 46.7% of the total respondents were familiar with this center. Of the respondents in categories one and three, 66.7% had such awareness while 50% of category five, 33% of category four and 16.7% of category two had familiarity with this research center. For the IFPRI center, 60% of the respondents indicated familiarity. Over 83% of category two knew of this center while more than 66% of categories one and three had such background. Over 33% of category four had familiarity with this center. Regarding ILCA, it was found that over 43% of the total group were well-acquainted with this center. Over two-thirds of category one respondents knew of this center while 50% of category three were acquainted, with over

TABLE V

PROFESSORS' FAMILIARITY WITH THE WORK OF OTHER INTERNATIONAL PROGRAMS

INTERNATIONAL CENTERS	DISTRIBUTION OF RESPONDENTS FAMILIAR WITH CENTERS BY CATEGORY										OVERALL		
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5				
	N	%	N	%	N	%	N	%	N	%	N	%	R
WARDA	2	33.3	3	50.0	3	50.0	2	33.3	0	0.0	10	33.3	9
ILRAD	3	50.0	3	50.0	4	66.7	3	50.0	3	50.0	16	53.3	5
IITA	4	66.7	3	50.0	2	33.3	2	33.3	3	50.0	14	46.7	7
IBPGR	4	66.7	1	16.7	4	66.7	2	33.3	3	50.0	14	46.7	7
IFPRI	4	66.7	5	83.3	4	66.7	2	33.3	3	50.0	18	60.0	4
ILCA	4	66.7	2	33.3	2	33.3	3	50.0	2	33.3	13	43.3	8
ICARDA	4	66.7	4	66.7	3	50.0	5	83.3	5	83.3	21	70.0	2
CIMMYT	6	100.0	6	100.0	5	83.3	5	83.3	6	100.0	28	93.3	1
ISNAR	3	50.0	4	66.7	2	33.3	2	33.3	4	66.7	15	50.0	6
ICRISAT	3	50.0	3	50.0	1	16.7	3	50.0	4	66.7	14	46.7	7
IRRI	6	100.0	6	100.0	2	33.3	4	66.7	2	33.3	20	66.7	3
CIP	5	83.3	1	16.7	2	33.3	2	33.3	3	50.0	13	43.3	8

33% of the other groups being familiar. In regard to ICARDA, this was the second best known center with 70% of the respondents of the overall categories being acquainted with the work developed by this institution. Over 83% of categories four and five were familiar with the work developed by this organization. Also, over 66% of categories one and two respondents knew of this institution while 50% reported being familiar with it. Compared as a total group, more than 93% reported being familiar with the work done by CIMMYT, making this center the best known for all the members of this study. As indicated on Table V, 100% of categories one, two and three were familiar with this center while over 83% of the other groups reported their awareness. For the ISNAR center, 50% of the respondents indicated being familiar with the work done by this institution while over 66% of categories two and five had knowledge of the work done by this center. Half of category one respondents knew of this center while in the remaining categories over 33% were familiar. In the case of ICRASAT, compared as a total group, over 46% were familiar with the work done by this institution. Two-thirds of category five had such awareness while 50% of categories one, two and four were acquainted and 16.7% of category three had familiarity with the research being accomplished in this institution. With regard to IRRI, over 66% of the respondents as a total group were acquainted with the work carried out by this institution. In categories one and two, 100% had familiarity while over 66% of category

four and over one-third of the remaining categories had known the work done by this institution. Finally, when compared as a total group, it was found that 13 (43.3%) of the respondents were familiar with the work done for CIP. Over 83% of group one had known this institution while category five reported 50% being familiar with this center. Of the respondents of category three and four, 33.3% had such awareness while 16.7% of category two were familiar with the work accomplished by this international center.

As reported in Table VI, the categories of respondents were asked to indicate their level of knowledge as to select commodities with which CIAT deals. It was found that, overall, respondents were "Slightly Knowledgeable" regarding cassava. Category 1 respondents indicated being "Moderately Knowledgeable" with the mean responses of all other groups falling into the "Slightly Knowledgeable" range. For rice, the overall mean response was higher, 1.20, but was still classified in the "Slightly Knowledgeable" response. The mean responses of all categories of respondents, except number two, fit into this classification with the latter being in the "Moderately Knowledgeable" realm. All categories of respondents, except group five and the total combined, indicated being "Very Knowledgeable" about beef. The responses from category five came in at "Moderately Knowledgeable" level. Concerning maize, respondents were "Very Knowledgeable" in the overall mean response. The mean

TABLE VI

MEAN RESPONSES OF SELECT GROUP OF OSU PROFESSORS AS TO LEVEL OF KNOWLEDGE WITH CIAT COMMODITIES

COMMODITY	MEAN RESPONSE BY CATEGORIES										OVERALL MEAN	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
CASSAVA	0.83 MK	1.17	0.67 SK	0.52	0.83 SK	0.75	0.83 SK	0.75	0.67 SK	0.52	0.77 SK	0.73
RICE	1.50 SK	1.05	1.83 MK	0.75	0.83 SK	0.98	1.33 SK	0.52	0.50 SK	0.55	1.20 SK	0.89
BEEF	2.83 VK	1.17	3.00 VK	0.63	2.67 VK	1.36	2.67 VK	1.03	2.18 MK	0.98	2.68 VK	1.03
MAIZE	2.67 VK	1.03	2.83 VK	0.41	2.83 VK	0.98	2.50 VK	1.05	2.33 MK	1.03	2.63 VK	0.89
BEANS	1.05 MK	1.50	2.00 MK	1.10	0.67 SK	0.82	1.83 MK	0.98	0.67 SK	0.82	1.33 SK	1.06

Sd = Standard deviation M = Mean SK = Slightly Knowledgeable MK = Moderate Knowledgeable VK = Very Knowledgeable

responses of all categories respondents except number five were in this classification, considered as "Moderately Knowledgeable". Maize and beef were the two commodities with which the respondents felt more familiarity. Finally, for beans, the overall mean responses were classified in the "Slightly Knowledgeable" response. The mean response for categories one, two and four indicated being "Moderate Knowledgeable" while groups three and five were classified as "Slightly Knowledgeable". This commodity was the most familiar for the respondents from the group "Slightly Knowledgeable"

Data shown in Tables VII through XIII present the perceptions of a group of OSU professors (N=30), assembled into five different categories, with regard to selected aspects of CIAT's 1990 research program.

Findings With Regard to the Type of Research CIAT Should Use as an Effective Tool to Overcome Latin American Production Problems

One intent of this study was to determine perceptions as to the type of research that CIAT should use as an effective tool to overcome the Latin American problems with regard to low crop production.

As indicated in Table VII, overall, respondents expressed a strong feeling, "Essential" (mean=3.50), for the

TABLE VII

PERCEPTIONS AS TO THE RELATIVE IMPORTANCE OF SELECTED TYPES OF RESEARCH IN WHICH CIAT SHOULD BE ENGAGED

TYPE OF RESEARCH	MEAN RESPONSE BY CATEGORIES										OVERALL		
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5				
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	
Basic research	1.83 MI	0.75	2.00 MI	0.63	1.83 MI	0.75	1.50 MI	1.05	1.68 MI	0.52	1.77 MI	0.73	
Strategic research	3.17 VI	0.75	3.33 VI	0.82	3.33 VI	0.81	2.50 VI	0.55	3.17 VI	0.41	3.10 VI	0.71	
Applied research	3.67 E	0.52	3.33 VI	0.82	3.67 E	0.52	3.67 E	0.52	3.17 VI	0.41	3.50 E	0.57	
Adaptative research	3.17 VI	1.17	3.67 E	3.67	3.83 E	0.41	3.17 VI	0.41	3.67 E	0.52	3.50 E	0.68	
Genetic characterization of germplasm to identify gene pools to be used in plant breading activities	3.17 VI	0.41	3.50 E	0.55	3.33 VI	0.52	3.00 VI	0.89	3.17 VI	0.41	3.23 VI	0.57	
Better understanding of the biological natural control mechanisms and epidemology of the most important diseases and pest of crops	3.34 VI	0.52	3.67 E	0.52	3.33 VI	0.52	3.50 E	0.55	3.50 E	0.55	3.47 VI	0.51	
Better understanding of plant/soil/ water microorganisms relationship	3.50 E	0.55	3.67 E	0.52	3.33 VI	0.52	3.40 VI	0.52	3.33 VI	0.52	3.43 VI	0.57	

Sd = Standard deviation M = Mean MI = Moderately Important VI = Very Important E = Essential.

practice of applied research and adaptative research. As perceived by this select group of OSU professors, this seems to be the best type of research that should be used by CIAT in Latin America. On the average, the total group of professors indicated that strategic research was "Very Important", and that basic research was "Moderately Important".

Table VII also details the professors' response as a total group that it was "Very Important" (mean= 3.47) for CIAT to conduct research to promote understanding of the biology, natural control mechanisms and epidemology of the most important diseases and pests of crops. Those in categories three, four and five responded at this level while those in categories one and two assigned an "Essential" rating to this area. With a mean of 3.43, the professors indicated they felt that it was "Very Important" for CIAT's 1990's programs to emphasize research for a better understanding of plant/soil/water micro-organism relationships. Respondents in categories two, four and five responded at the "Essential" level on the average, while for the others, a "Very Important" response was indicated. With a mean of 3.23, they consider it to be "Very Important" for CIAT to use technology for the genetic characterization of germplasm and to identify gene pools to be used in plant breeding activities. Category two respondents expressed an "Essential" level of importance, while for the others a "Very Important" level was indicated. With a mean of 3.23, they

consider it to be "Very Important" for CIAT to use technology for the genetic characterization of germplasm, and to identify gene pools to be used in plant breeding activities. Category 2 respondents expressed an "Essential" level importance while for the others, a "Very Important" level was indicated.

Findings With Regard to the Development of Technological Priorities Concerned With CIAT's 1990's Program

The third objective was to determine CIAT's priorities during the 1990's program as perceived by a group of OSU professors. Table VIII indicates that this group of professors considered that excessive genetic uniformity, with a mean of 3.63, is "Essential" to CIAT's 1990's programs, and that a continuation of germplasm conservation would be "Essential" (mean=3.50) for technological priorities during CIAT's 1990's programs. Also, it is important to recognize that respondents in category four perceive these two levels of technological concern as "Very Important".

One of the most meaningful aspects of the study was to find out if excessive deforestation in tropical countries should be a technological priority for the 1990's program. Groups one, two, and three felt that it was "Very Important" but groups four and five felt that it was "Essential". In the overall (mean=3.40), the OSU faculty surveyed felt that

TABLE VIII

PERCEPTIONS AS TO IMPORTANCE OF TECHNOLOGY DEVELOPMENT PRIORITIES FOR CIAT 1990'S PROGRAM

AREAS OF TECHNOLOGY DEVELOPMENT	MEAN RESPONSE BY CATEGORIES										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Excessive deforestation	3.00 VI	1.10	3.33 VI	0.52	3.33 VI	0.82	3.67 E	0.82	3.67 E	0.82	3.40 VI	0.81
Species extinction	3.00 VI	0.63	3.33 VI	0.52	3.67 E	0.52	3.17 VI	0.75	3.67 E	0.52	3.37 VI	0.62
Misuse of chemical inputs	3.00 VI	0.00	3.67 E	0.52	3.83 E	0.81	3.17 VI	0.75	3.17 VI	0.41	3.37 VI	0.56
Inapropriate land use	3.00 VI	0.89	3.27 VI	0.81	3.67 E	0.52	3.50 E	0.55	3.17 VI	0.41	3.30 VI	0.60
Inapropriate cultural practices	3.34 VI	0.52	3.50 E	0.55	3.00 VI	0.55	3.17 VI	0.75	3.67 E	0.52	3.43 VI	0.57
Excessive genetic uniformity	3.83 E	0.41	3.50 E	0.55	3.50 E	0.00	3.33 VI	0.82	4.00 E	0.00	3.63 E	0.56
Germplasm conservation	3.50 E	0.55	3.50 E	0.55	3.83 E	0.55	3.17 VI	0.98	3.50	0.55	3.50 E	0.63

Sd = Standard deviation M = Mean MI = Moderately Important VI = Very Important E = Essential

CIAT's program should recognize the use of new technology to prevent the excessive increasing deforestation problems and that could be "Very Important".

One of the questions was about inappropriate cultural practices. Categories two and five felt that dealing with this problem was "Essential", but on the other hand groups one, three, and four felt that it was "Very Important" to develop technological priorities concerning the program. In general, the professors felt that dealing with inappropriate cultural practices is a "Very Important" issue to consider (mean=3.43). This is exemplified in Table VIII.

In Table VIII, the group of professors have shown that they feel it is "Very Important" for CIAT's program to promote new and appropriate technologies to overcome the problem of species extinction and misuse of chemical inputs (mean=3.37). It is important to notice that those in categories three and five felt it "Essential" that CIAT emphasize research in species extinction, while categories two and three felt the same for misuse of chemical inputs.

As is shown in Table VIII the group of OSU professors felt that it is "Very Important" (mean=3.30) for CIAT's program to be involved in developing technology to approach the inappropriate land use in developing countries. In this case categories three and four felt that it was "Essential" for CIAT to deal with this situation.

Findings With Regard to the Importance of Development of New Activities, Decentralization Activities and Education

Another aim of this study was to ascertain perceptions as to the research areas that CIAT should strengthen as an effective mechanism to overcome the Latin American problems with regard to the development of new activities, decentralization activities and agricultural education.

Findings presented in Table IX show certain selected responses from a group of OSU professors regarding on-the-job-training. It was considered "Essential" (mean=3.77) to CIAT to be engaged in these kinds of programs. Also, Table IX reveals findings with respect to economic and rural sociological research, which overall the respondents rated as "Essential" (mean=3.73), with a mean of 3.00. Respondents in category five answered at the "Very Important" level, while the mean responses of all other groups fell into "Essential". Also, respondents considered it "Essential" in a homogeneous that CIAT be engaged in graduate training (mean=3.73). Regarding technical training, it was found that on the overall mean, respondents felt it to be "Essential" for the center to maintain its technical training. Respondents in categories two, three and four perceived at the "Essential" level, while the other categories opted for a " Very Important" level.

TABLE IX

PERCEPTIONS IN REGARD TO IMPORTANCE OF DEVELOPMENT OF NEW ACTIVITIES, DECENTRALIZATION ACTIVITIES AND EDUCATION

RESEARCH ACTIVITIES	MEAN RESPONSE BY GROUPS										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Closer relationship between NATIONAL PROGRAMS and CIAT	1.50 MI	1.23	2.33 MI	0.83	2.33 MI	1.51	1.67 MI	1.03	3.50 E	0.55	2.27 MI	1.23
Increasing decentralization	2.50 MI	1.05	2.00 MI	0.63	2.50 VI	1.23	2.33 MI	0.82	1.67 MI	0.52	2.20 MI	0.89
Involvement in extension programs	3.50 E	1.23	3.50 E	0.55	3.83 E	0.41	3.33 VI	0.82	3.50 E	0.55	3.53 E	0.73
Long term educational programs	2.60 VI	1.27	3.17 VI	0.75	2.83 VI	0.98	3.33 VI	0.82	3.50 E	0.55	2.97 VI	1.00
Short term educational programs	3.83 E	0.81	3.67 E	0.52	3.33 VI	0.52	3.67 E	0.52	3.83 E	0.41	3.67 E	0.48
Technical training	3.33 VI	1.03	4.00 E	0.00	4.00 E	0.00	3.67 E	0.52	3.33 E	0.52	3.67 E	0.61
On the job training	4.00 E	0.00	3.83 E	0.81	3.67 E	0.42	3.67 E	0.52	3.67 E	0.67	3.77 E	0.44
Undergraduate agricultural linkages	2.00 MI	1.10	2.00 MI	0.98	1.50 MI	0.84	2.50 VI	1.83	2.00 MI	1.27	2.00 MI	1.12
Graduate agricultural linkages	3.50 E	0.55	3.83 E	0.41	3.83 E	0.53	3.67 E	0.52	3.83 E	0.41	3.73 E	0.45
Linkage with US Land-Grant universities	3.33 VI	0.82	3.50 E	0.55	3.50 E	0.84	3.67 E	0.52	2.67 VI	0.52	3.33 VI	0.71
Economic and rural sociological research	3.50 E	0.84	4.00 E	0.00	4.00 E	0.00	3.67 E	0.82	3.00 VI	0.48	3.73 E	0.58

Sd = Standard deviation M = Mean MI = Moderately Important VI = Very important E = Essential

One of the findings of the study was that respondents on the overall mean indicated it was "Essential" that CIAT should be dealing with short term educational programs. Those respondents in category three, with a mean of 3.33, responded at the "Very Important" level. The group as a whole expressed that it was "Essential" (mean=3.53) for CIAT to be involved in extension programs. With a mean of 3.33, the professors in category four believed it to be "Very Important" for the center to pursue this kind of activity. In general, the overall mean expresses the importance of extension programs, educational programs and research. As indicated in Table IX, overall, respondents expressed a strong belief, "Very Important" (mean=3.33), for the linkage with land-grant universities. Respondents in categories one and five responded at this level; whereas, categories two, three and four responded at the "Essential" level. In addition, the group of professors on the average responded that it was "Very Important" (mean=2.97) for CIAT to continue its efforts on long-term educational goals during its 1990's program. Responses from those in category five were defined as "Essential" (mean=3.50) for this effort.

Furthermore, the responses in Table IX with respect to the issue of increasing decentralization and a closer relationship between national programs and CIAT indicated those surveyed considered this to be "moderately Important". These issues received overall mean scores of 2.20 and 2.27 respectively. However, it is important to mention that group

five felt that a closer relationship between national programs and CIAT was "Essential" (mean=3.5).

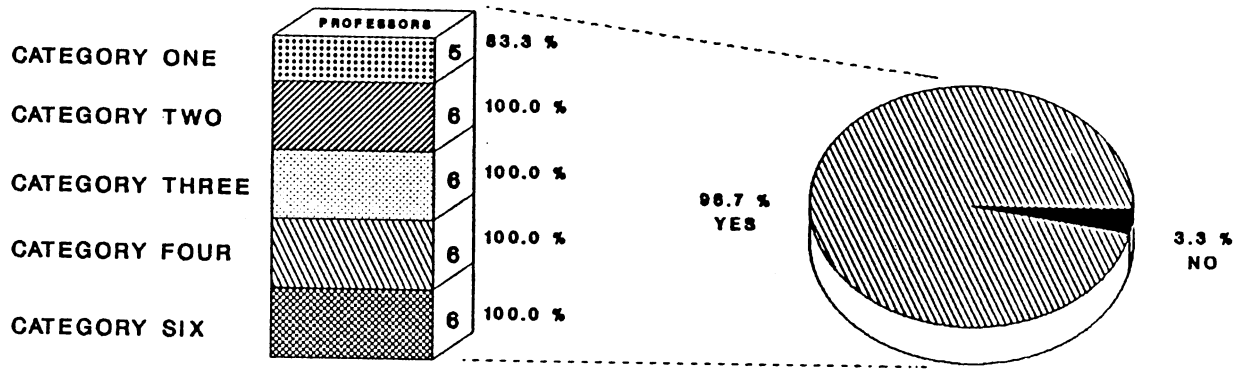
This score denotes that social scientists with expertise in the change and adoption process believe more strongly in close work between Colombian Institute of Agriculture (ICA) and CIAT in the sense that this process may enhance the appropriate development of CIAT's 1990's program for the country.

An opinion question was asked to the group of professors as to what extent would it be important to Colombia and other developing countries if CIAT developed a linkage with agricultural universities at the undergraduate level. The overall perception of this group of professors was "Moderately Important" (mean=2.00). With a mean of 2.50, respondents in category four perceived it as "Very Important" while the other groups considered it "Moderately Important" (mean=2.00, 2.00, 1.50 and 1.27 respectively).

Figure 4. presents the perceptions as to whether it would be beneficial to create a new entity for the integration, research and field for CIAT's mandate commodities. Twenty-nine respondents expressed "YES" (96.7 %) and one responded "NO" (3.30 %). Thus, CIAT might work with and through various international, regional and local development institutions and projects to speed the validation and delivery of such technology. CIAT should look for the possibility of creating a new institutional entity dedicated to development of activities for CIAT's mandate commodities.

FIGURE 4

PERCEPTIONS AS TO THE BENEFITS TO CREATE A NEW ENTITY FOR THE INTEGRATION OF RESEARCH/FIELD



Findings in Regard to a Program Focusing Varying Resource Farmers

Objective five is divided into four main sections. Section one's goal was to identify priority areas in terms of short and long term goals essential to the success of a research program focusing special attention on low marginal and medium resource farmers. Data collected at this regard are presented in Table X.

Perceptions of the OSU group of professors showed that focus of attention on low resource farmers in medium to high potential areas should be considered "Essential" as the long term goals of the program. The mean for this was 3.60. On the other hand, the same priorities should be considered as "Very Important" as short term goals, the mean was 3.47. Respondents in categories one, four and five expressed "Essential" as their overall mean response.

It is interesting to note that focus on marginal farmers in marginal potential areas was considered "Very Important" as long term goals and as short term goals (mean=3.33) as presented in Table X. For the short-term goals respondents in categories three and five considered this level "Essential". For long-term goals, just group five had the same level of classification, "Essential". It is very noticeable that group four considered focus on this group as "Moderately Important" as long-term goals.

TABLE X

PERCEPTIONS AS TO IMPORTANCE OF PRIORITY AREAS FOR CIAT'S 1990'S PROGRAM FOCUSING ON LOW, MARGINAL, AND MEDIUM RESOURCE FARMERS

Priority Areas for Focus of Attention	MEAN RESPONSE BY CATEGORIES										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Marginal resource farmers in marginal potential areas												
Short term goals	3.00 VI	1.01	3.17 VI	0.75	3.83 E	0.41	2.83 VI	1.17	3.83 E	0.41	3.33 VI	0.89
Long term goals	2.83 VI	0.89	3.33 VI	0.82	2.83 VI	0.41	2.33 MI	0.82	3.67 E	0.52	3.00 VI	0.95
Low resource farmers in medium to high potential areas												
Short term goals	3.50 E	0.55	3.33 VI	0.52	3.33 VI	1.17	3.50 E	0.55	3.67 E	0.52	3.47 VI	0.51
Long term goals	3.67 E	0.52	3.50 E	0.55	3.67 E	0.52	3.67 E	0.52	3.50 E	0.84	3.60 E	0.57
Medium resource farmers in low to medium potential areas												
Short term goals	3.00 VI	0.90	3.17 VI	0.75	3.50 E	0.55	3.17 VI	0.98	3.50 E	0.55	3.27 VI	0.74
Long term goals	3.33 VI	0.52	3.00 VI	0.63	3.50 E	0.55	3.00 VI	0.63	3.17 VI	0.41	3.20 VI	0.55
Medium resources farmers in high potential areas												
Short term goals	3.33 VI	0.82	3.00 VI	0.00	3.83 E	0.41	3.17 VI	0.41	3.17 VI	0.75	3.30 VI	0.60
Long term goals	3.68 E	0.52	3.50 E	0.55	3.50 E	0.55	3.17 VI	0.75	2.67 VI	0.82	3.30 VI	0.70

Sd = Standard Deviation M = Mean VI = Very Important E = Essential.

There was no considerable difference to be noted when a comparison was made regarding focusing attention on medium resource farmers in low to medium potential areas as short and long term goals. This was perceived as "Very Important" priority for short and long term goals areas with overall means of 3.27 and 3.20 respectively. For the short-term goals, categories three and five considered such a focus as "Essential" while category three considered this to be "Essential" for long-term goals.

Centering attention of CIAT programs on medium resource farmers in high potential areas on the overall means was considered "Very Important" priority with a mean of 3.30 as both short term and long term goals. Those respondents in categories one, two and three responded as "Essential" to this focus as long-term goals while respondents from group three considered it to also be "Essential" that attention be focused on medium resource farmers in high potential areas as short-term goals.

Findings in Respect to Perceptions of New Commodities to be Added to CIAT's 1990's Program

Data shown in Table XI present the perceptions of a selected group of professors from OSU concerning three new commodities -soy beans, vegetables and tropical fruits to be implemented in CIAT's 1990's program.

TABLE XI

PERCEPTIONS OF PIORITIES FOR THE CIAT'S 1990'S PROGRAM FOCUSING ON NEW COMMODITIES.

COMMODITIES	MEAN RESPONSE BY CATEGORIES										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Soybeans	1.83 MI	1.71	2.00 MI	1.10	1.67 MI	0.52	1.50 MI	0.84	2.50 VI	1.05	1.20 MI	0.96
Vegetables	2.83 VI	1.47	3.67 VI	0.52	3.83 E	0.17	2.83 VI	1.47	3.33 VI	0.52	3.30 E	1.02
Tropical fruits	3.17 VI	1.60	3.50 E	0.55	0.40 E	0.00	3.50 E	0.55	3.50 E	0.55	3.53 E	0.82

Sd = Standard deviation M = Mean MI = Moderately Important VI= Very Important E = Essential

Findings presented in Table XI show a strong difference among the three commodities. According to this group of professors, tropical fruits are considered as an "Essential" priority with a mean of 3.53. Those respondents in category one indicated this commodity was a "Very Important" priority as indicated by this 3.17 mean response.

Additional findings reported in Table XI reveal that vegetables were considered to be "Very Important" with a mean of 3.30. It is interesting to note that groups two and three considered this commodity to be "Essential" too. The means for groups two and three were 3.67 and 3.83 in comparison with the means of groups one, four and five which were 2.83, 2.83 and 3.33 respectively, all falling in the "Very Important" range.

By contrast, these professors' responses, as shown in Table XI, establish their feelings that soybeans should be considered as "Moderately Important" with a mean of 1.90. Group one through four questioned agreed that this commodity is "Moderately Important" while group five believed it to be "Very Important" as a commodity.

Findings as to Perceptions of Priorities Areas For Increasing Research Efforts For CIAT's 1990's Program

Data shown in Table XII present the perceptions of the selected group of professors from OSU in regard to priority areas for CIAT's 1990's program to increase research efforts.

TABLE XII

PERCEPTIONS AS TO PRIORITY AREAS IN WHICH RESEARCH EFFORTS SHOULD BE INCREASED IN CIAT'S 1990'S PROGRAM

Priority Areas for Research Efforts	MEAN RESPONSES BY CATEGORIES										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Genetic resources characterization (including "hi-tech" areas such a gene mapping) and documentation	3.00 VI	1.27	3.50 E	0.55	3.00 VI	1.27	2.33 MI	1.21	2.83 VI	1.17	2.93 VI	1.11
Nonconventional breeding systems	3.00 VI	1.55	3.33 VI	0.52	3.17 VI	0.41	2.67 VI	1.03	3.50 E	0.55	3.13 VI	0.90
Natural resources management	3.00 VI	1.10	3.33 VI	0.52	3.50 E	0.55	3.50 E	0.55	3.67 E	0.52	3.40 VI	0.68
Integration of pest management	3.67 E	0.52	3.50 E	0.55	3.50 E	0.55	3.67 E	0.52	3.50 E	0.55	3.57 E	0.50
Post harvest technology	3.50 E	0.55	3.50 E	0.55	3.67 E	0.52	3.17 E	1.17	4.00 E	0.00	3.57 E	0.68
Policy research and promotion	3.33 VI	1.21	3.67 E	0.52	3.67 E	0.52	2.67 VI	1.21	3.50 E	0.55	3.37 VI	0.89
On farm research	3.68 E	0.52	3.67 E	0.52	3.50 E	0.55	3.33 VI	0.82	3.33 VI	0.52	3.50 E	0.57
Cultural practices	3.83 E	0.41	3.33 VI	0.52	3.33 VI	0.52	3.17 VI	0.75	3.67 E	0.52	3.47 VI	0.57

Sd = Standard deviation M = Mean VI = Very Important E = Essential.

These data show that respondents consider it to be "Very Important" that increasing research efforts in genetic resources characterization (including "high-tech" areas such as gene mapping) and documentation be pursued. This item received an overall mean of 2.93. The exception to this pattern was group two, providing a mean of 3.5 which represented this need as "Essential". All the other groups presented similar perceptions, "Very Important", as the means show (3.00, 3.00 and 2.83 for groups one, three and five, respectively). In comparison, group four presents a mean of 2.33 which represents the consideration of increasing research in this area as "Moderately Important".

Perceptions regarding the research in post harvest technology, (mean=3.57), integration of pest management (mean =3.57) and on farm research (mean=3.56) were perceived by the professors to be "Essential"; only respondents from categories four and five considered these to be as low as "Very Important". As presented in Table XII, among the categories the differences were not substantial. It is important to note that post harvest technology is one of the biggest concerns for the Latin American "campesino".

One of the questions asked about increasing research efforts in non-conventional breeding systems showed that all groups were in homogeneous concordance that this was "Very Important" for 1990's program. The overall mean was 3.13. Nevertheless, professors in category five placed an

"Essential" value of importance on this area.

With regard to natural resources management, as a whole, the respondents perceived this to be "Very Important" (mean= 3.40). However, it should also be noted that groups three, four and five felt that research in this area was "Essential" as a priority for the CIAT's 1990's program. Judgmental perceptions regarding increasing the research effort on cultural practices showed that respondents felt this issue to be a "Very Important" priority on the basis of overall mean. Those in categories one, two and three responded at this level while those in categories one and five assigned an "Essential" rating to this area.

As reported in Table XII, the categories of respondents were asked to indicate their perceptions as to what extent would it be beneficial to CIAT to increase its research efforts on policy research and promotion. It was found that, overall, respondents expressed a "Very Important" priority regarding this issue. In categories two, three and five, respondents indicated "Essential" on the average with the mean responses of other groups falling into the overall level.

Findings in Regard to Priority Areas for Increasing Institutional Building Efforts

The means of the responses indicating the perceptions of

a select group of OSU professors regarding the priority areas for the increase of institutional building efforts for CIAT's 1990's program are presented in Table XIII.

The responses from the group of professors with respect to this issue showed that training methodology and materials development (mean=3.70) should be considered "Essential" in the 1990's program with regard to institutional building efforts. The professors from category four rated it a bit lower, but felt it was "Very Important" for CIAT's institutional building efforts in this type of development.

In regard to the training of trainers, the group of OSU professors felt the priority was "Essential" (mean=3.67) on the overall mean. Those in categories two, three, four and five fit into this level but category one, whose respondents considered this to be a "Very Important" priority, was the exception. Those surveyed also felt it was "Essential" (mean=3.60) to increase production training. Those respondents from categories one, two, three and five responded at this same value while professors from category four considered this effort's priority to be "Very Important".

Perceptions regarding the provision of leadership in integration of regional cooperations were also considered an "Essential" (mean=3.57) priority for the program. As shown in Table XIII, most of the categories of respondents hold that it is of "Essential" priority. Group four felt it was at the "Very Important" level.

TABLE XIII

PERCEPTIONS AS TO PRIORITY AREAS FOR THE CIAT'S 1990'S PROGRAM TO INCREASE INSTITUTIONAL BUILDING EFFORTS

INSTITUTIONAL BUILDING EFFORTS	MEAN RESPONSE BY CATEGORIES										OVERALL	
	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5			
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
Specialized and advanced degree training	3.00 VI	1.60	3.50 E	0.55	3.50 E	0.55	2.67 VI	1 03	3.83 E	0.41	3.30 VI	0.88
Training of trainers	3.17 VI	0 75	4.00 E	0.00	3.83 E	0.41	3.50 E	0.84	3.83 E	0.41	3.67 E	0.61
Training methodology and materials development	3.50 E	0.55	3.83 E	0.41	4.00 E	0.00	3.17 VI	0.75	4.00 E	0.00	3.70 E	0.54
Production training	3.83 E	0.41	3.50 E	0.55	3.83 E	0.41	2.83 VI	0.98	4.00 E	0.00	3.60 E	0.68
In country training	3.50 E	0.55	3.33 VI	0.52	3.83 E	0.41	3.17 VI	0.75	3.33 VI	0.82	3.43 VI	0.68
Providing leadership in integrating regional cooperation	3.67 E	0.52	3.50 E	0.55	3.50 E	0.55	3.33 VI	0.82	3.83 E	0.41	3.57 E	0.57

Sd = Standard deviation M = Mean VI = Very Important E = Essential.

With regard to specialized and advanced degree training, the respondents perceived this to be an "Very Important" issue (mean=3.30). However it should also be noted that group two (mean=3.50), group three (3.50) and group five (mean=3.83) considered this aspect to be of "Essential" priority. In comparison, the mean scores of groups one and four were 3.00 and 2.67, respectively and represented the "Very Important" level.

The OSU group of professors felt that the priority for in country training was "Very Important" with an overall mean of 3.43. The mean responses of all categories of respondents, with the exception of categories one and three, fit into this classification. The remaining categories classified this as being of "Essential" priority.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to present a brief review of the study, including the design and pursuit of the research as well as a brief review of the major findings.

This chapter is also intended to present conclusions which are largely based upon the analysis and summarization of the data collected and upon observation and impressions resulting from the task of designing and conducting the study.

Some mention is also made of findings based upon (1) review of literature; (2) personal experiences of the author as both an animal science researcher and a visitor in nine other developing nations; (3) personal experience from work with Dr. U. J. Grant (CIAT and ICA's founder in Colombia).

Summary

Intent and Purpose

The intent of the study was to determine the perceptions of a select group of professors at OSU (n=30) with international experience in agriculture in regard to agricultural research needs concerning the present strategic

plan of an agriculture research center in Colombia, International Center of Tropical Agriculture (CIAT). The results of this study should have potential value towards an assessment of CIAT's 1990's research program in Colombia.

Objectives

The following objectives were formulated in order to accomplish the purpose of the study:

1. To determine selected demographic characteristics of respondents such as areas of international interest and experience, familiarity with CIAT and other international research centers and knowledge of commodities with which CIAT deals.
2. To determine the relative importance of selected types of research for CIAT.
3. To determine the importance of CIAT being concerned with selected programs to develop technology without environmental degradation.
4. To determine the importance for CIAT to develop of selected new activities, decentralization of activities and education.
5. To determine the importance of CIAT's short and long term goals, focusing attention on different groups of farmers in varying situations.
6. To determine the importance for CIAT to study selected new commodities and to increase research efforts in

selected additional areas.

7. To determine the importance for CIAT to increase selected institution-building efforts.
8. To make recommendations for priority areas which may enhance the effectiveness of CIAT's 1990's program.

Rationale

This study was constructed to collect the thoughts and opinions of a group of OSU professors concerning the agricultural research needs for the assessment of CIAT's second long-strategic program. The first CIAT program from the 1980's has served the center well for the past decade. It is the intent of CIAT's directors to develop a new strategic plan for the 1990's.

The first plan, "CIAT in the 1980's", began with a thorough analysis of the socio-economic setting in Latin America; and the socio-economic situation in Africa and Asia, particularly as they pertained to the center's mandated crops.

The chief purpose of these analyses (particularly the more detailed one for Latin America) was to evaluate the population's primary sources of calories and proteins and the principal components of farming systems. This was done in order to determine which crops should have priority. These data were compared with the mandates of sister centers and other research institutions. The purpose of this comparison was to determine whether or not the commodities that had

evolved as part of CIAT's mandate were the most appropriate to correct commodity mix.

This determination has been confirmed by analysis on current and projected trends for the commodities in CIAT's mandate. This decision has demonstrated the anticipated demand for these products exceeding the supply at current rates of growth. Thus, there is a current need for improved production technology that will make possible adequate food supplies at reasonable prices.

A strategic plan must be developed within the continuing Raison d'etre of an institution. The plan should reflect a change in strategies from one planning horizon to the next. The basic purpose of the institution's existence should endure.

The essence of any international research institution's values is the concern for human welfare and dignity. It is believed that alleviation of poverty and hunger is an important requisite to the betterment of the human condition. Also, it is believed that to insure a more equitable society, researchers must seek benefits in favor of the under-privileged whenever possible.

In addition, there is an optimism towards the future and the role that agricultural research can play in making a better future for mankind.

Finally, there is a consciousness of the heavy responsibility that CIAT bears to utilize the resources entrusted to them in the most effective and efficient manner

to achieve its goals and to be accountable to those that CIAT serves, "campesinos", as well as those who provide the resources for their efforts.

Design and Conduct of the Study

Succeeding a review of previously completed research literature related to the problem, the major responsibilities involved in the design and conduct of the study were: (1) selection of the study population, (2) selection and development of the questionnaire for data collection and validation of the questionnaire, (3) collection of data, (4) affirmation a method for analyzing and describing the collected data, (5) analysis of the findings and (6) preparation of recommendations for implementation of CIAT's 1990 program.

The population of the study was restricted to Oklahoma State University professors functionally employed in the College of Agriculture. These professors each had previous international experience in their respective major field and in developing countries.

The sample size for this study was 30 professors from the College of Agriculture. These professors were divided into five different groups. The groups were formed according to the experience of each professor and according to the objectives of this study. Each group was composed of six professors.

The five groups included professors from agronomy,

agricultural education, agricultural economics, entomology, forestry, biochemistry, human nutrition, and also the Assistant Dean in International Agriculture.

To provide comparative treatment of data, a five point Likert-type scale was used to measure the relative degree of perception by the professors. Numerical values were assigned to the response categories as shown in Table II, previously presented.

Findings of the Study

Respondent professors had international experiences in Central America, South America, Africa and Asia. A total of 14 such experiences were reported. As summarized in Figure 5, the extent of these experiences were as follows: Central America, 29.73%, South America, 32.43%, Asia, 17.57% and Africa, 20.27%.

As illustrated in Figure 6, eighty percent of the respondents were somewhat knowledgeable of the work accomplished by CIAT, 16.7% had very little knowledge, 3.3% knew nothing and no one knew fully.

Regarding the level of familiarity with the work accomplished by other international centers, summarized in Figure 7, it was found that 33.3% of the professors were familiar with WARDA, over 53% of the respondents were familiar with ILRAD, more than 46% indicated being familiar with IITA, 46.7% were familiar with IBPGR, 60% indicated

FIGURE 5

INTERNATIONAL AGRICULTURE EXPERIENCES OF OSU FACULTY RESPONDENTS

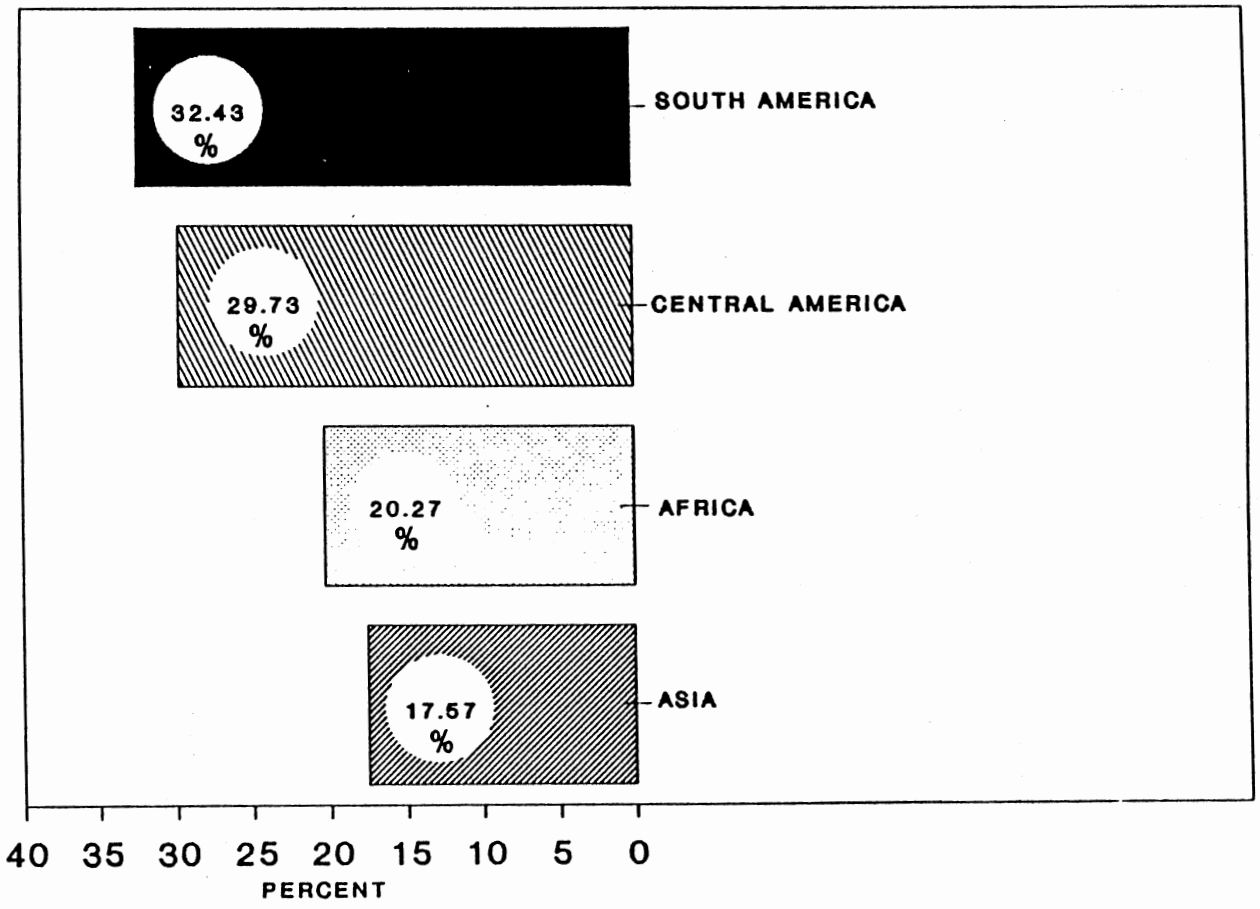


FIGURE 6

RESPONDENTS' LEVEL OF KNOWLEDGE WITH WORK ACCOMPLISHED BY CIAT

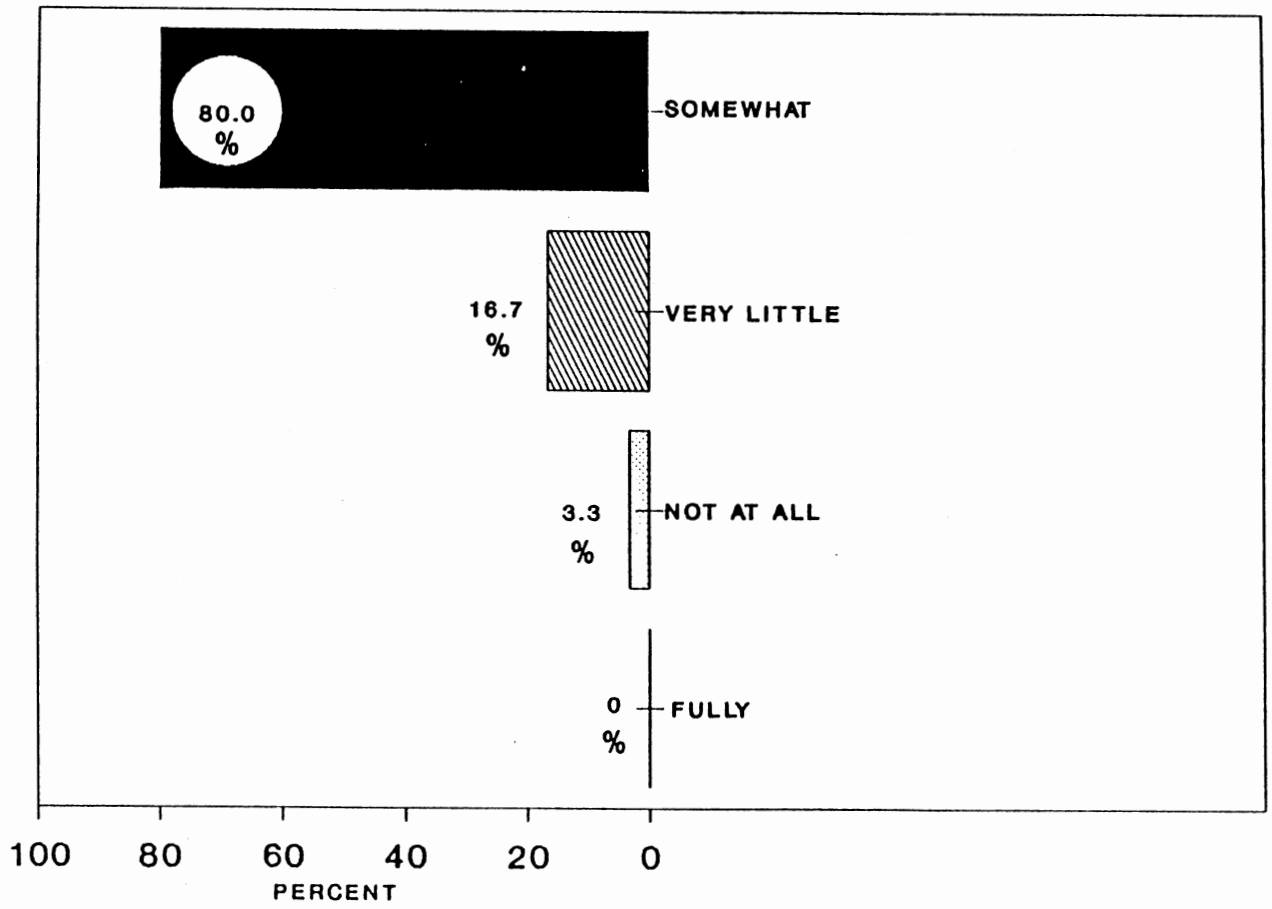
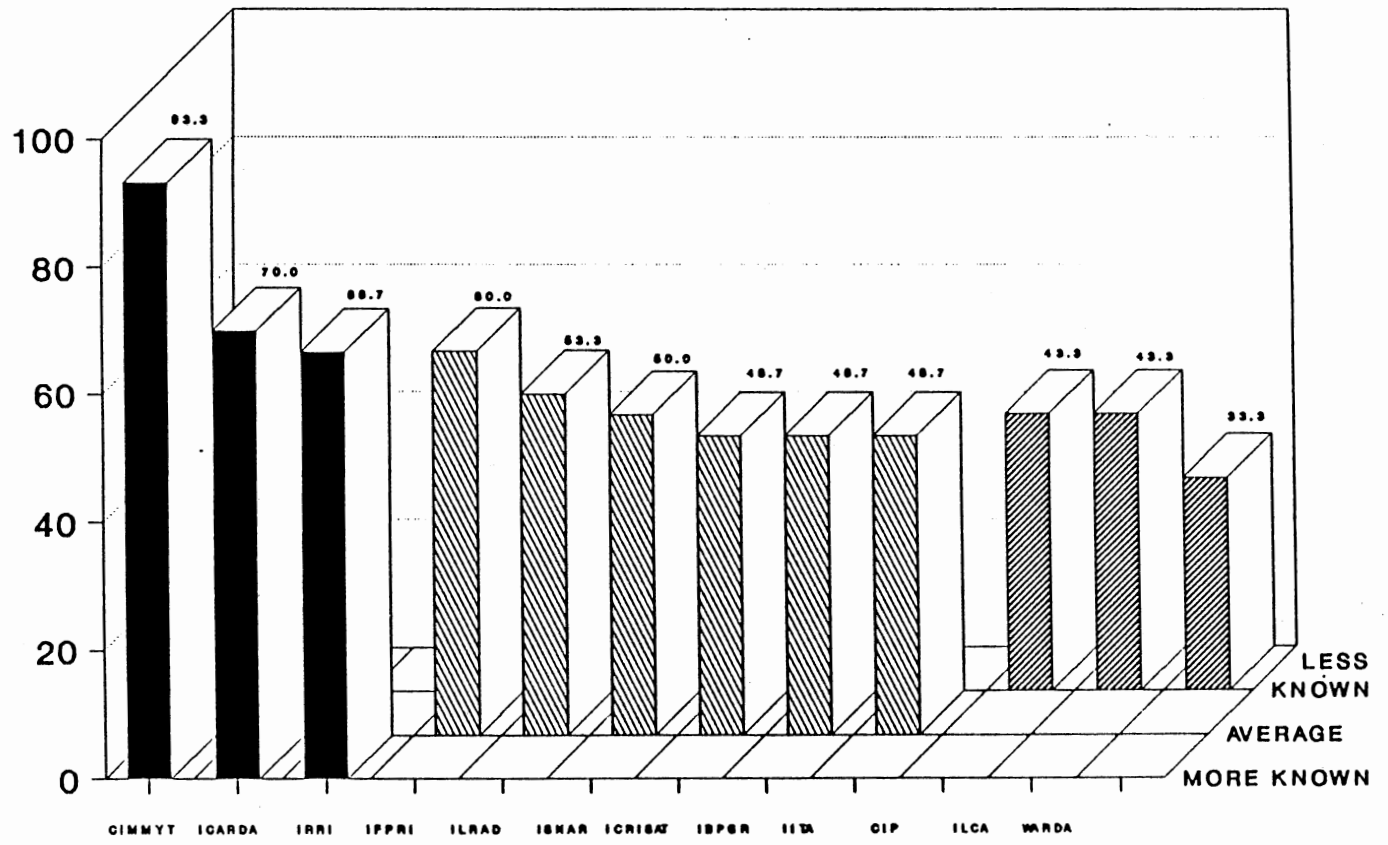


FIGURE 7

PERCENTAGES OF RESPONDENTS FAMILIAR WITH WORK ACCOMPLISHED BY OTHER INTERNATIONAL CENTERS



familiarity with IFPRY center, over 40% had such familiarity with ILCAD and 70% of the respondents were acquainted with the work developed for ICARDA. Also over 93% reported being familiar with the work done by CIMMYT making it the best known for the group of professors while 50% of the respondents were familiar with ISNAR. Over 46% showed being familiar with the work accomplished by ICRISAT, more than 66% of respondents were familiar with IRRI and 43.3% of the group of professors were familiar with CIP.

As can be seen by examination of findings summarized in Figure 8, respondents were "Very Knowledgeable" regarding beef (mean=2.68) and maize (mean=2.63). They were "Slightly Knowledgeable" with regard to beans (mean=1.33), rice (mean=1.20) and cassava (mean=0.77).

Importance of Types of Research. Figure 9 was designed to summarize the perceptions of respondents overall as to the importance of selected types of research in which CIAT should be engaged to promote possible increases in agricultural productivity.

As described previously, the main importance ratings were determined through use of a scale to convert numerical means to category means. These importance categories and symbols used for each in the following figures were as follows: Essential (E), Very Important (VI), Moderately Important (MI), Slightly Important (SI) and Not Important (NI).

As shown in Figure 9, with mean scores given for the

FIGURE 8

MEAN RESPONSES OF PROFESSORS AS TO LEVEL OF KNOWLEDGE WITH CIAT COMMODITIES

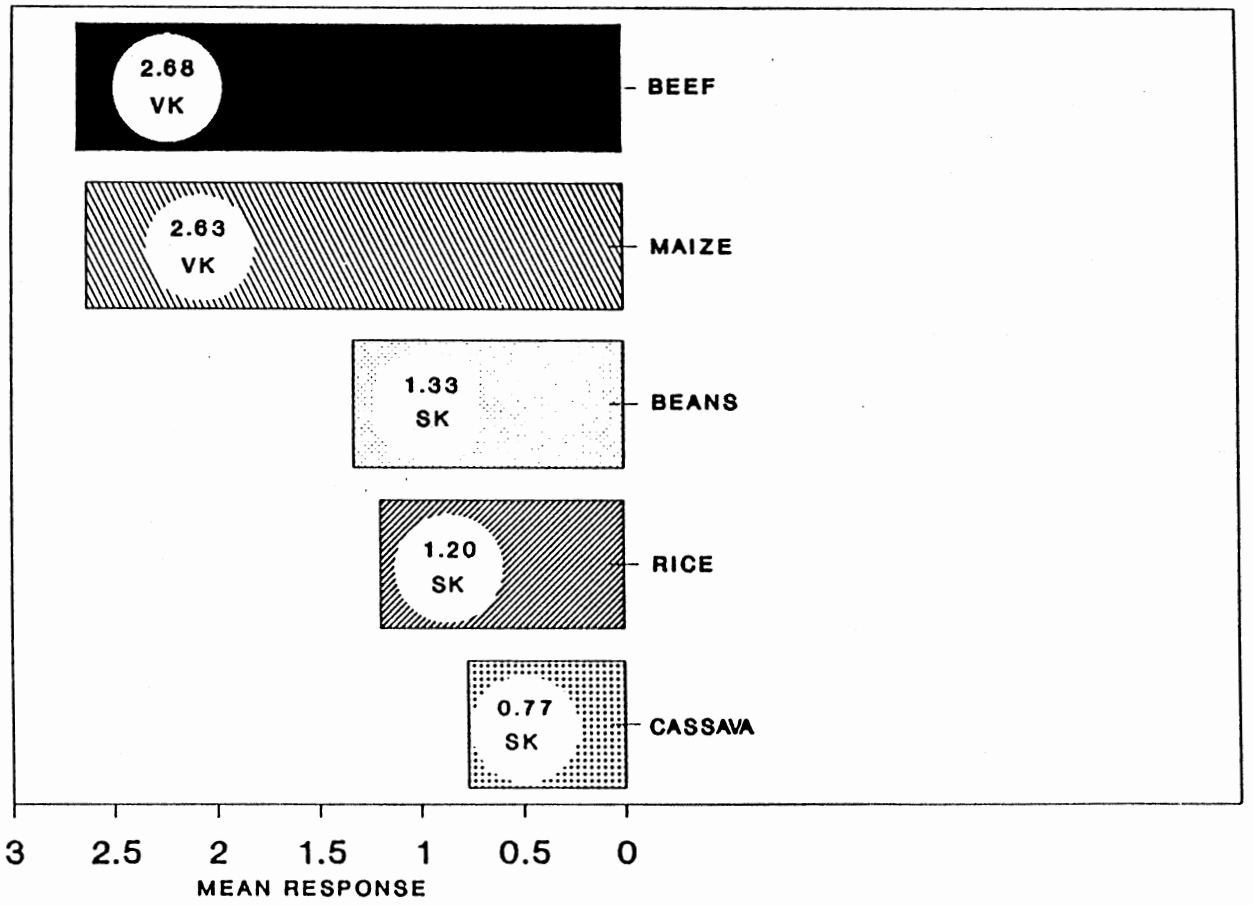
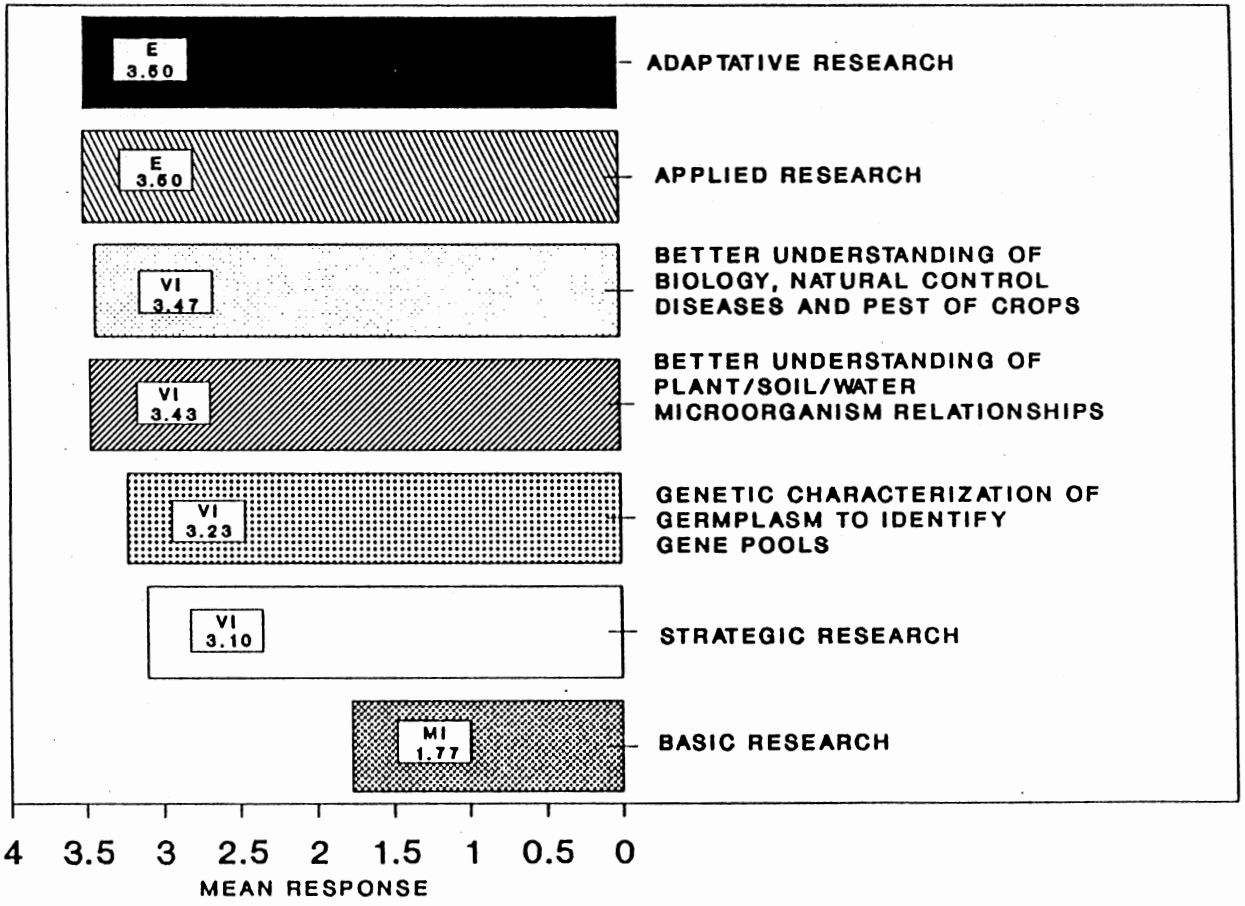


FIGURE 9

MEAN PERCEPTIONS OF IMPORTANCE OF TYPE OF RESEARCH IN WHICH CIAT SHOULD BE ENGAGED



overall group, it became evident that the group of professors agreed that it is "Essential" to pursue Applied and Adaptive Research (both with a mean of 3.50). They considered it to be "Very important" to promote research regarding the better understanding of the plant/soil/water microorganism relationship (mean=3.43). They also felt that is was "Very Important" to conduct research to increase understanding of the mechanisms and epidemology of the most important diseases and pests of mandate commodity crops (mean=3.23) as presented in Figure 9. However, they perceived Basic Research to be "Moderately Important" (mean=1.77) as a type of research to be used to enhance the future program.

Importance of Development of Technology to Avoid Environmental Degradation. As can be seen by examination of findings summarized in Figure 10, OSU professors responded as to their perceptions on each of seven items pertaining to technology priorities. It was indicated that they felt two of the seven items were "Essential". These were dealing with excessive genetic uniformity and germplasm conservation. Each one of the remaining five was perceived as "Very Important". These were: inappropriate cultural practices, excessive deforestation, misuse of chemical inputs, species in extinction, and inappropriate land use.

Importance of Selected New Activities, Decentralization Activities and Education. Figure 11, presents a summary of responses related to respondent perceptions of new

FIGURE 10

MEAN PERCEPTIONS OF IMPORTANCE OF DEVELOPMENT OF TECHNOLOGY TO AVOID ENVIRONMENTAL DEGRADATION

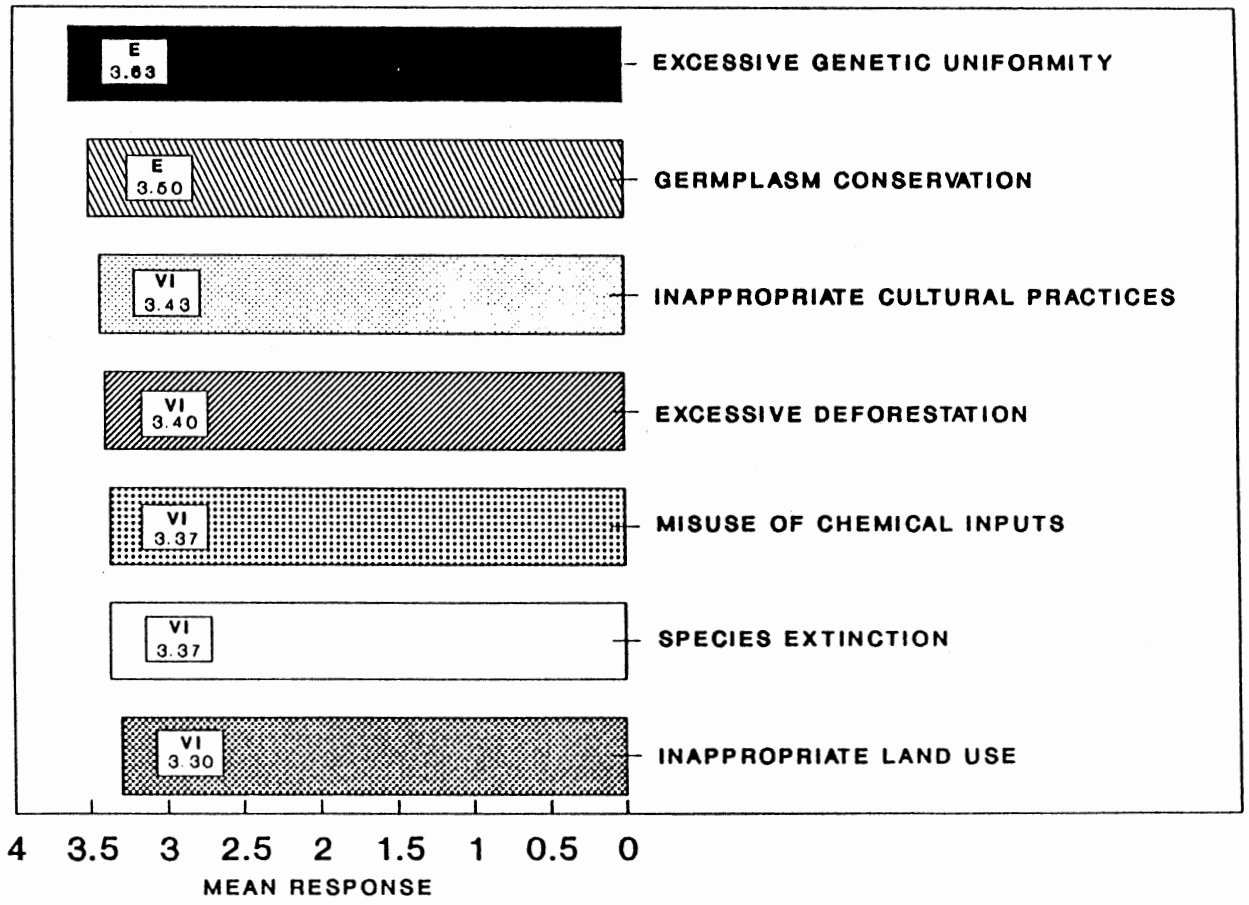
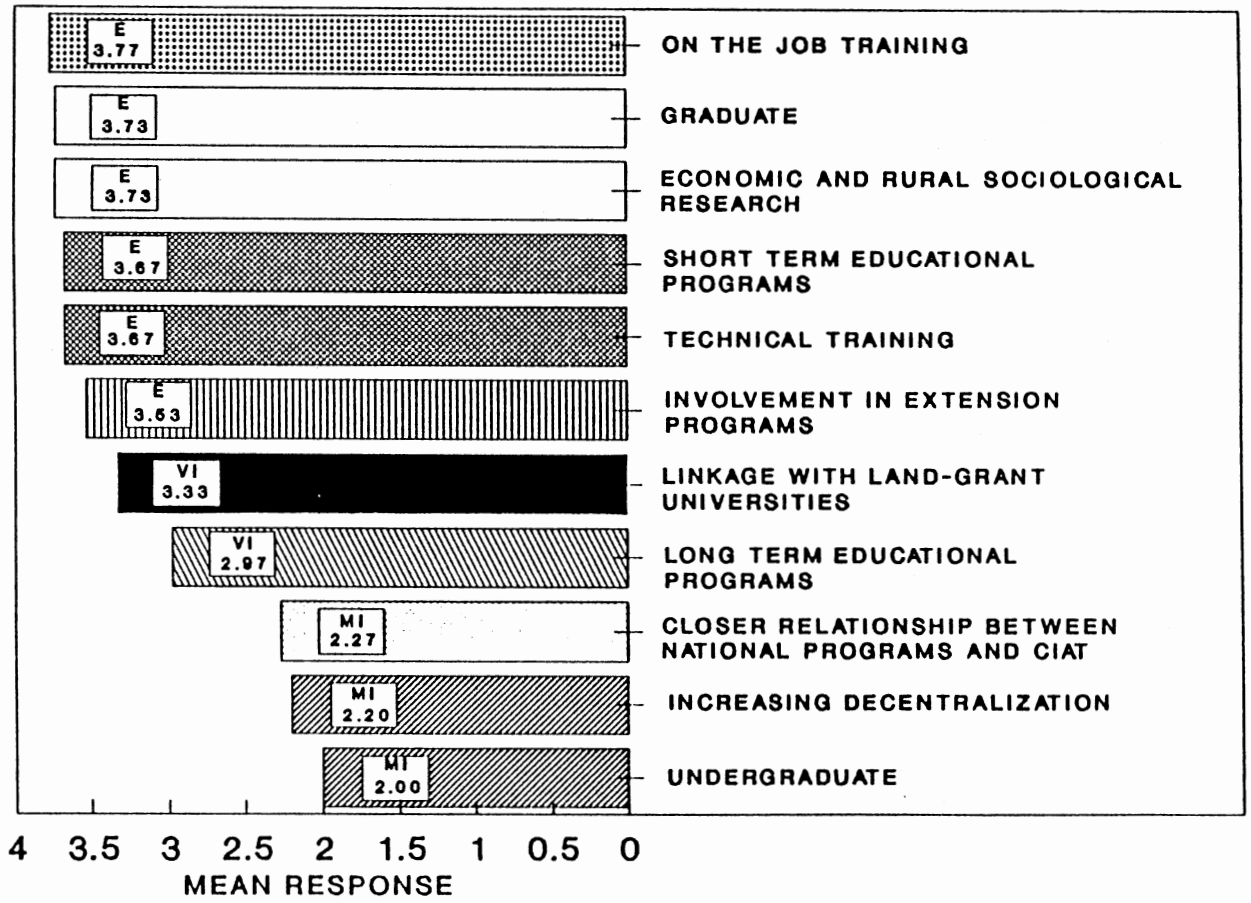


FIGURE 11

MEAN PERCEPTIONS REGARDING IMPORTANCE OF NEW ACTIVITIES, DECENTRALIZATION AND EDUCATION



activities, decentralization and education that may enhance the 1990's CIAT program.

Among 11 items, there were found to be noticeable differences among perceptions. The group felt that seven of the twelve items were "Essential". These items in order by mean response levels were: on the job training, economic and rural sociological research, graduate agricultural linkages, short term educational programs, technical training, and involvement in extension programs. Two of the 11 items were perceived as "Very Important". These items were the following: linkage with U.S. land grant universities and long term educational programs.

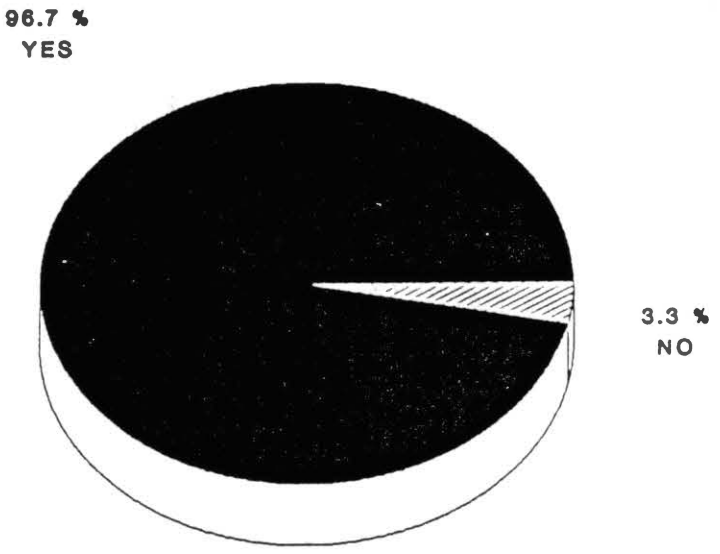
Each one of the remaining items were perceived as "Moderately Important". They were: closer relationships between the national programs and CIAT, increasing decentralization and undergraduate agricultural linkages.

Figure 12 presents the perceptions of the group of professors as to the benefits of creating a new entity for the research/field. By a margin of 96.7 percent to 3.3 percent, the respondents perceived that CIAT would benefit from creating a new entity to integrate research and field activity.

Importance of Focus of Attention on Different Groups of Farmers in Varying Situations. One concern of the study was to obtain perceptions as to the importance of the focus of attention by CIAT on different groups of farmers in varying

FIGURE 12

PERCEPTIONS AS TO THE BENEFITS Of
CREATING A NEW ENTITY FOR
THE INTEGRATION OF
RESEARCH\FIELD



situations as short/long term goals for the organization. Findings related to this are summarized in Figure 13. As reported there, respondents perceived that a long term goal of attending to needs of low resource farmers in medium to high potential areas was of "Essential" importance receiving an overall mean of 3.60. Attention focused on this same group, as a short term goal, received a 3.47 or "Very Important" rating. This same importance rating, as merited by the 3.33 mean response, was assigned to focusing on marginal resource farmers in marginal potential areas as short term goals. Receiving 3.30, or "Very Important" rating were the goals of assigning priority to medium resource farmers in high potential areas on both a short and long term basis. Another "Very Important" (mean=3.27) short term goal was perceived to be focusing attention on medium resource farmers in low to medium potential areas. Placing long-term priority on this group was also judged to be "Very Important" but at the slightly lower level of 3.20. The lowest rated priority at 3.00, but still categorized as "Very Important" was a long-term goal of work with marginal farmers in marginal potential areas.

New Commodities For CIAT's 1990's Program. Figure 14, presents the perceptions of the OSU group of professors related to new commodities that might receive some consideration and be added to CIAT's 1990's program.

Among the three commodities, tropical fruits were considered to be an "Essential" commodity with a mean of

FIGURE 13

MEAN PERCEPTIONS AS TO IMPORTANCE OF PRIORITY AREAS FOR CIAT'S 1990'S PROGRAM FOCUSING ON LOW, MARGINAL AND MEDIUM RESORCE FARMERS

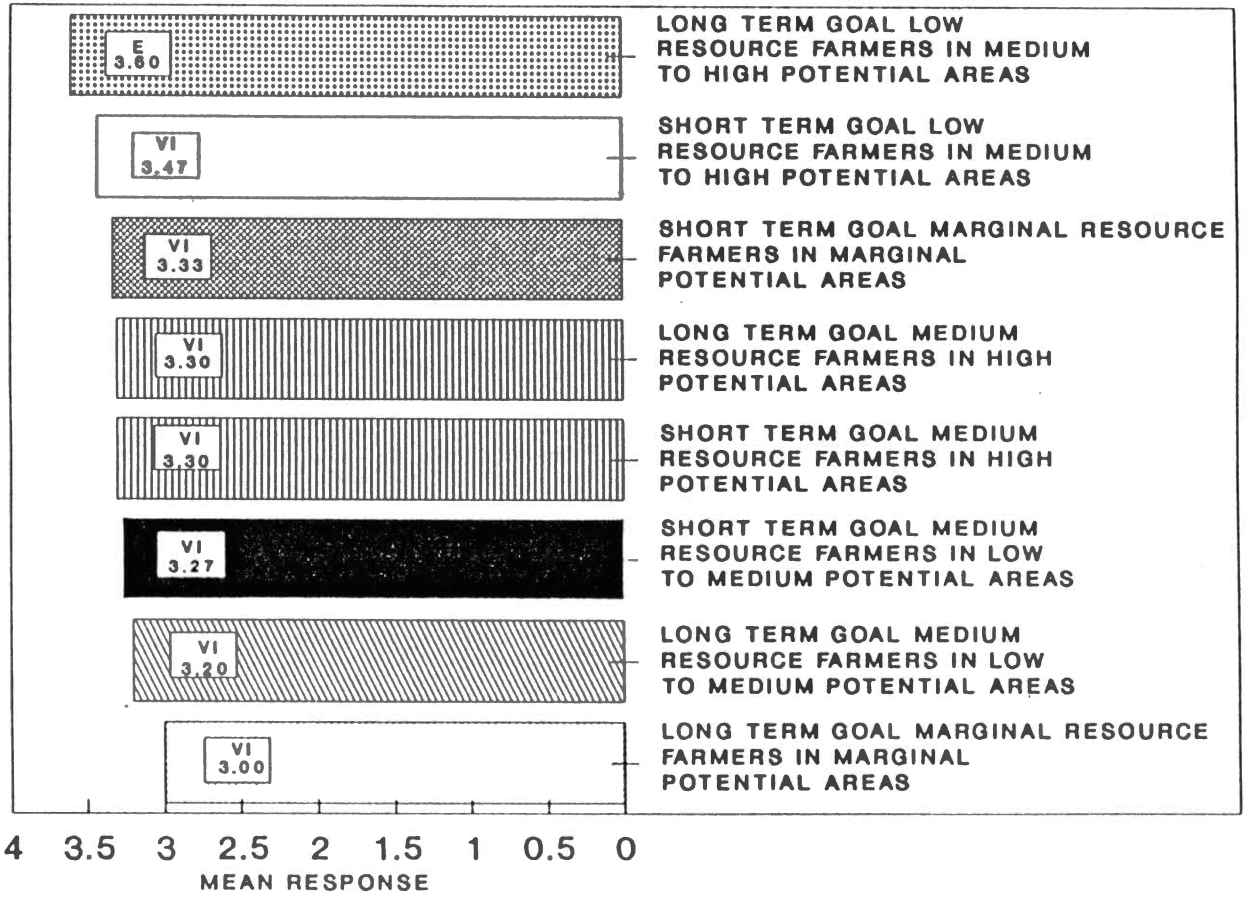
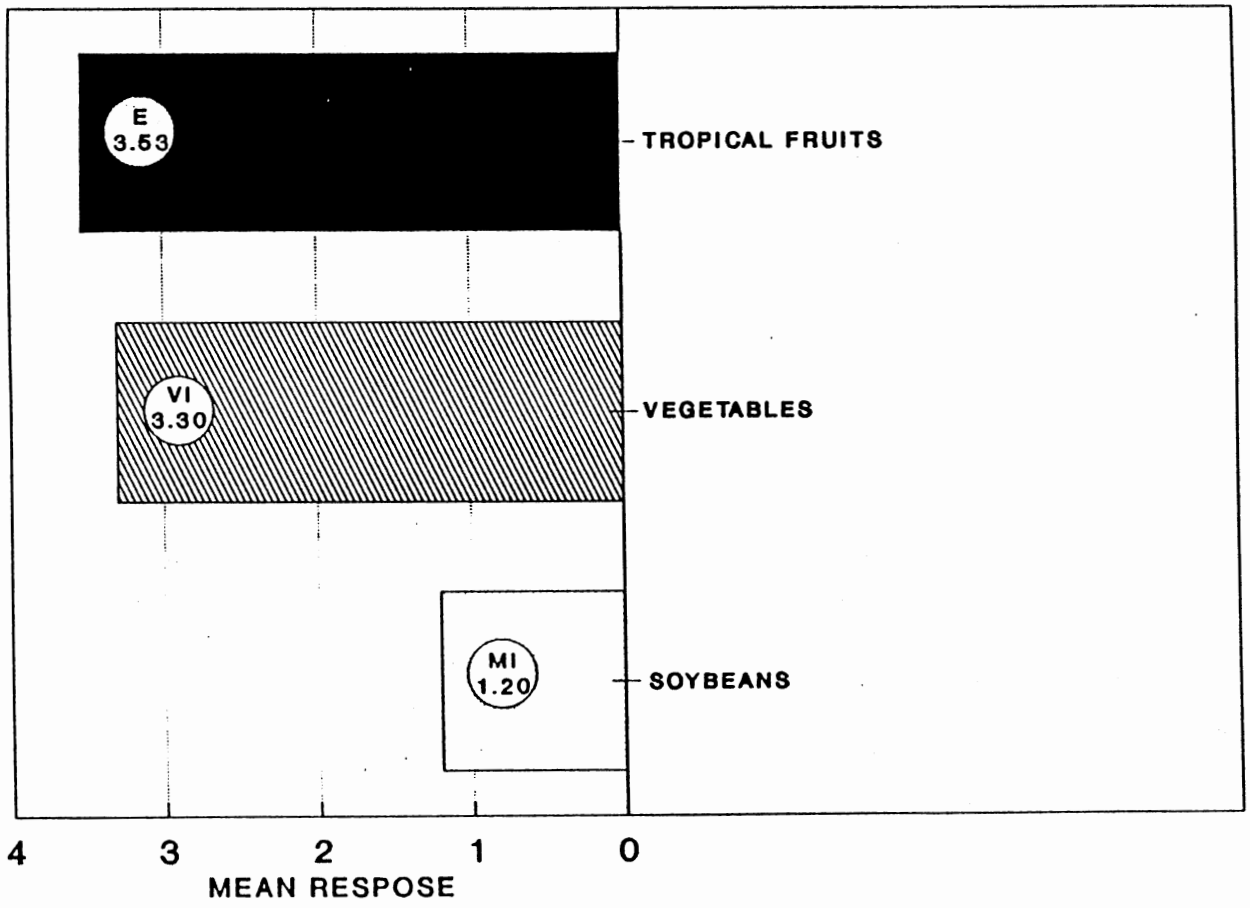


FIGURE 14

MEANS RESPONSES AS TO THE POTENTIAL IMPORTANCE FOR CIAT RESEARCH OF NEW COMMODITIES



3.53. Also, vegetables were considered "Very Important" with a mean of 3.30 and Soy beans "Moderately Important" with a mean of 1.20.

Priority Areas For Increased Research by CIAT in The 1990's. Figure 15 is a summary of perceptions regarding priorities areas in which research efforts should be increased in CIAT's 1990's program.

Research efforts which the group as a whole judged should receive an "Essential" emphasis in the 1990's were: (1) integration of pest management, (2) post-harvest technology and (3) on-farm research. These received respective mean responses of 3.57, 3.57 and 3.50. The remaining were judged as "Very Important" in terms of receiving increased attention for future research. These and their mean responses were: (1) cultural practices (3.47), (2) natural resources management (3.40), (3) policy research and promotion (3.37), (4) nonconventional breeding systems (3.13), and (5) genetic resources characterization (including "hi-tech" areas such a gene mapping) and documentation (2.93).

Importance of Increased Institutional Building Efforts by CIAT in 1990's. Figure 16 summarizes the mean responses regarding perceptions as to needs for selected increased institutional building efforts for CIAT's 1990's program.

Those efforts, which the group as a whole judge, to be of "Essential" importance were: (1) training methodology and

FIGURE 15

MEAN PERCEPTIONS OF IMPORTANCE OF RESEARCH EFFORTS WHICH CIAT SHOULD INCREASE DURING 1990'S PROGRAM

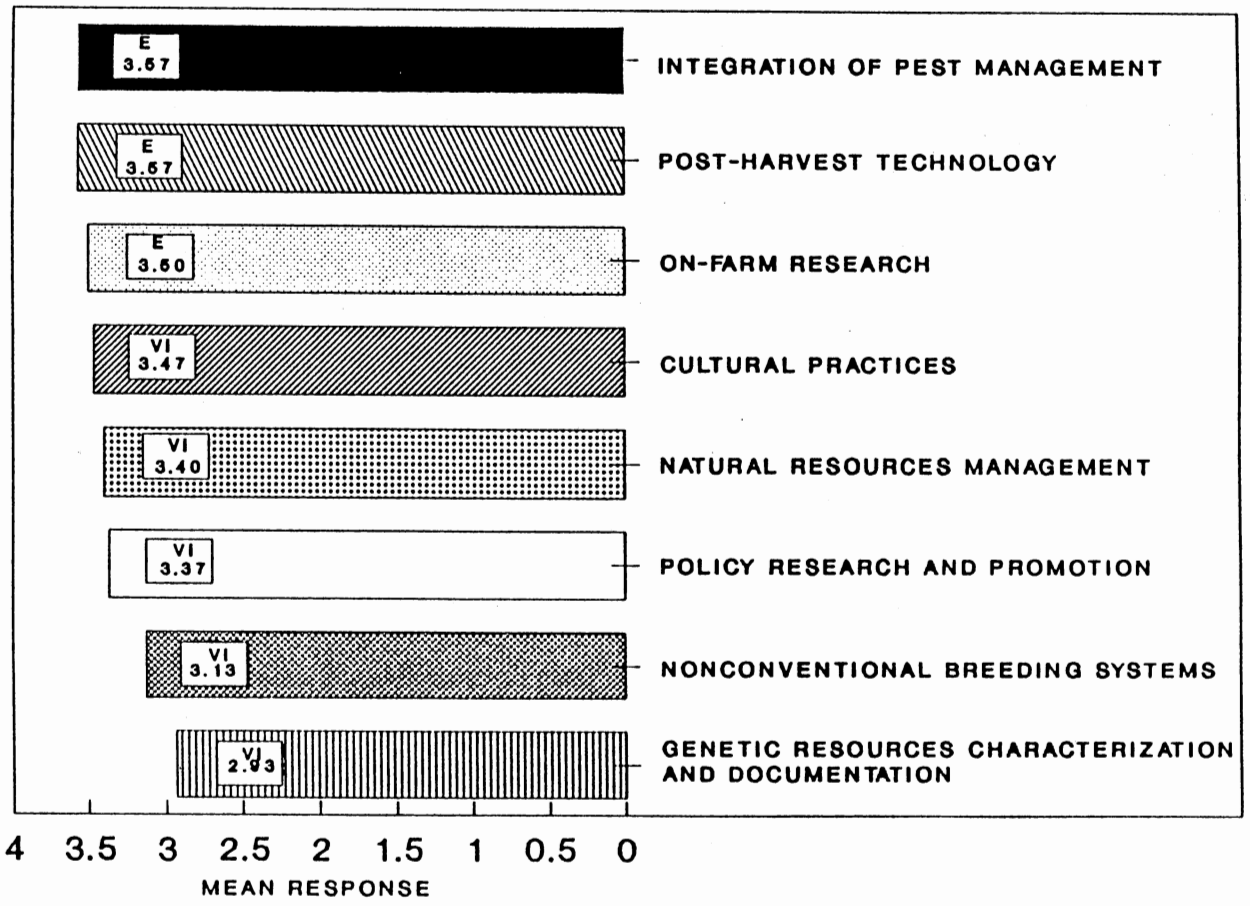
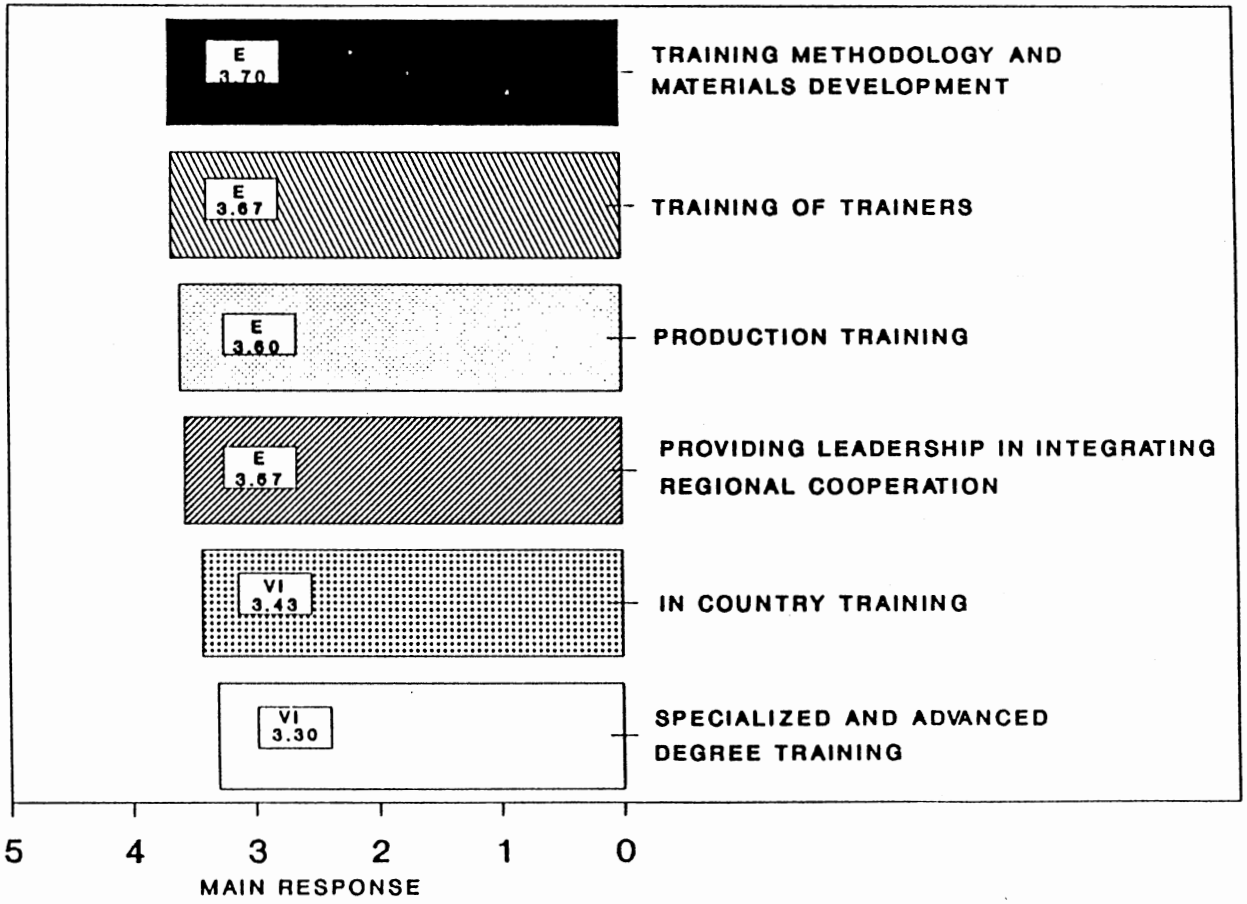


FIGURE 16

MEAN PERCEPTIONS OF IMPORTANCE OF SOME PRIORITY AREAS IN WHICH CIAT SHOULD INCREASE ITS INSTITUTIONAL BUILDING EFFORT



materials development, (2) training of trainers, (3) production training and (4) providing leadership in integrating regional cooperation. Mean responses for these were 3.70, 3.67, 3.60, and 3.57, respectively. The remaining two were judge as "Very Important" and were: (1) in-country training and (2) specialized and advanced degree training with respective means of 3.43 and 3.30.

Conclusions

After a thorough study and analysis of the data the following conclusions were made:

1. Based on the findings, the group of OSU professors presented a high degree of international experience, especially in South and Central America.

2. It can be concluded that the group of professors were somewhat knowledgeable of the agricultural research work conducted by CIAT.

3. In like manner, it can be concluded that the group of respondents presented a high level of familiarity with the work accomplished by CIMMYT, ICARDA and IRRI and low familiarity with the work done by WARDA, CIP and ILCA.

4. In like manner, it can be concluded that the respondents were very knowledgeable in regards to beef and maize but only slightly knowledgeable with respect to cassava, rice and beans, CIAT's main commodities.

5. Based on the findings, it can be concluded that CIAT

should use mainly applied and adaptative research. In addition, promoting new research for the better understanding of biology, natural control of diseases, pest of the crops and plant/soil/water microorganism relationships should be considered.

6. It can be concluded that the respondents were agreed that CIAT 1990's plan must deal with any technological and research practice to avoid environmental degradation. Such practices should deal with excessive genetic uniformity, germplasm conservation, inappropriate cultural practices, excessive deforestation, misuse of chemical inputs, species extinction and inappropriate land use.

7. It can be concluded in terms of importance of priority areas focusing in low, marginal and medium farmers that CIAT should emphasize this range, especially on concerns for low resource farmers in medium to high potential areas.

8. It can be concluded that the group of respondents were strong supporters of new activities, such as on-the-job-training, graduate agricultural links, economic and rural sociological research, short term educational programs, technical training and involvement in extension programs. Along with these perceptions, the group of respondents were less supportive of a linkage with land grant universities and long term educational programs. Likewise, the group showed even less support for closer relationship between national programs, increasing decentralization and undergraduate

agricultural links.

9. It can likewise be concluded that the respondents were strongly agreed on the creation of a new entity for the integration of research/field.

10. In like manner, it can be conclude that new commodities, such as tropical fruits and vegetables, should be taken into consideration during the 1990's program.

11. It is concluded that CIAT should increase its research efforts in integration of pest management, post-harvest technology and on-farm research.

12. It is further decided that training methodology and material development, training of trainers, production training, and providing leadership in integrating regional cooperation should be considered as an essential part of the 1990's research program.

13. These results could provide valuable guidance for CIAT's program planning, but by themselves are not adequate as the primary basis for program planning. Inputs from other sources are needed.

14. More research is needed; specially regarding perceptions of the members of other international research centers.

Recommendations

1. This group of OSU professors clearly seem to recognize, at the present, that the two major types of research that CIAT should use are applied research and

adaptative research.

Future development around these two concepts will allow CIAT researchers to minimize the gap caused by the differences between experimental and operational conditions including plot size and a retrievable gap caused by diverse technical and socio-economic circumstances, varying with location.

2. As stated, basic research is defined as a fundamental research with no prior purpose other than the advancement of knowledge. This area has been totally excluded from CIAT's past program and must remain so. However, CIAT must use this knowledge as building blocks in their work and must be aware of new findings and techniques particularly in the biological areas. CIAT must also maintain close ties to advanced research laboratories and universities around the world.

According to the OSU professors' perceptions, there is no doubt that CIAT should move to applied, adaptative and strategic research. This conclusion rests in two primary factors highly correlated with the literature review: (1) greater opportunities offered by recent scientific development, particularly in the area of tissue culture, molecular biology and genetic engineering; (2) the growing ability of some national programs to assume more responsibility for certain aspects of technological components development.

CIAT's 1990 program should move in a gradual shift in emphasis from applied to strategic research. Some of the

strategic research activities that must increase include:

- Genetic characterization of germplasm to identify gene pools and recombinant ability to facilitate more accurate identification of progenitors for CIAT's and national agriculture research plant breeding activities.

- Better understanding of the biology, natural control mechanisms and epidemiology of the causal organisms of the most important diseases and pests of crops in CIAT's mandate commodities.

- Better understanding of plant mechanisms related to yield, photosynthetic efficiency, drought tolerance and more efficient nutrient utilization.

- Better understanding of plant/soil/microorganism relationships.

Intimately related to biotechnology is the application of "High-Tech" methods of virus detention and control. New methods such as: the use of monoclonal antibodies, nuclear hybridization and transgenetic methods of inducing resistance, will supplement traditional methods that are being used. These new methods will help to better index materials for quarantine purposes and to better identify strains for more accurate selection in breeding programs and in developing resistant lines.

Moving to basic research may present the danger of CIAT becoming involved in highly specialized research for which it does not have a comparative advantage in terms of scientific

expertise, equipment or facilities. To avoid this danger, it will become even more important than in the past to generate collaborating activities with advanced scientific institutions.

For this reason CIAT should promote networks in the areas of highest priority for the commodity programs. However, some activities which might be casually classified as strategic research need to be expanded. These include such areas as small farmer feed production, pilot projects, integrated utilization and marketing, and farmer participatory research.

3. Natural resources management is an area of great significance to sustainability and environmental concerns. CIAT's activities in germplasm conservation and management give it a decided comparative advantage in this area, which should be emphasized in the 1990's program. One of the most important considerations for future generations is the maintenance of genetic diversity and CIAT's preservation of germplasm for common beans, cassava and selected tropical forages. CIAT has assembled the largest collection in the world of these species and has an active program of collection, evaluation and distribution.

CIAT's efforts in this area has been severely restricted by resource limitations. CIAT might significantly increase the resources to this task. This will allow not only an expansion of current activities, but will also permit the modern biotechnological tools towards better germplasm

characterization. This will not only preserve these valuable materials from genetic erosion, but will also work as more useful tools in the genetic improvement activities in their commodity programs and the National Research Institute.

4. The traditional gap between research and extension must be narrowed and this effort can be achieved by increased efforts in on-farm research and on the job training.

Partnership with national agricultural research and development systems should have some considerations in 1990's CIAT program. In a broad sense, it means that CIAT might share with them the responsibility for the generation and transference of improved technology. There are also a number of activities that they can perform together.

Thus, a key component throughout the process of strategic planning might be consultation with a national research center to ascertain its views on the nature of the partnership and the type of support they will desire from CIAT.

It is also necessary for CIAT, according to the group of professors' perceptions, to increase its emphasis in short term educational programs, and its graduate involvement with the national agriculture universities, and also to maintain its efforts in training.

Past experience in CIAT's programs has led to a great concern that new technology quickly produces a positive social impact. CIAT should realize that there are often impediments at the local level for the achievement of

technological objectives. Thus, CIAT might work with and through various international, regional and local development institutions and projects to speed the validation and delivery of such technology. CIAT should look for the possibility of creating a new institutional entity dedicated to the development of activities for CIAT's mandate commodities.

This new entity could provide effective integration from the researchers (laboratories) to the field, offering also a comparative advantage less readily apparent for other organizations, such as coffee growers that do not research in CIAT commodities.

Another important issue is the balance between research and training activities carried out by CIAT headquarters or in regional programs. CIAT might outpost staff in regional programs in order to get close to the national programs and deal with region/specific problems.

According to the OSU group of professors, the degree of decentralization may actually diminish and this factor might be true if a second headquarters for beans to serve Africa is established. (CIAT report 1989). At the present, with relatively weak national program in Africa, CIAT is conducting its own regional activities there with and within national programs.

This procedure has been broadly welcomed by African national programs, and may continue in this way for sometime. However, this can result in the considerable dispersal of

staff and also in management problems. This adds considerable complexity to CIAT's program management. For CIAT's 1990's program it might be more beneficial to explore the possibility of consolidation of efforts by concentrating outpost staff in Africa in a single "center of excellence".

5. Many of the poorest people live in countries that have inadequate resources to meet the many competing needs for better education, health, housing and infrastructure to enable them to achieve a reasonable quality of life for their citizens. Equity is one of CIAT's underlying values and technology produced by the center must be such that it avoids exacerbating existing income priorities.

However, the redistribution of the existing wealth will not be adequate to meet the enormous needs; the goal must be for the poor to receive a large portion of a growing pie. Thus overall economic development must be an essential component of CIAT's goals. Agricultural development is the key to economic development and improved technology is the most powerful tool that CIAT can achieve to benefit producers and consumers alike.

The orientation of such technological development must be such that the needs of the present are met without compromising the ability of future generations to meet their needs.

CIAT's concerns for poverty and equity must focus special attention on low-resource farmers. Rural income can be improved by increasing productivity costs. However, this

is often not adequate if restricted to food alone. Many farms have such small parcels that they can significantly increase their likelihood only by cultivating higher-value crops. Additionally, highest population pressures are often found in more favored regions. Thus CIAT's concerns should often be found in more favored regions.

Consequently, CIAT's concerns for poor producers shouldn't be interpreted as research concentrating on marginal farmers in marginal areas alone. While continuing to focus special attention on the needs of low-resource farmers, more attention should be given to those in this category that are capable of producing marketable surpluses and operating in medium to high potential areas. These have a greater likelihood of achieving a decent life and also are more responsive to the adoption of modern technologies which can increase productivity in a sustainable manner.

It is consumers who benefit most from agricultural research as increased productivity and reduced unit of production costs lower the relative prices they pay for food and other necessities.

Such a positive social benefit is maximized when research results are applied where they will achieve the greatest productivity impact.

It is for this reason that CIAT's strategy cannot aim exclusively at increasing production by low-resource farmers. The highest social return on research investment must be an important criterion in the framing of the center and its

future program.

6. There is an urgent need for improved production technology that will make possible adequate food supplies at reasonable prices. In response to this need, and in order to lead the benefits of investment today, it is essential that the current commodities programs continue their efforts undiminished during 1990's program.

These are not reasons to phase out any of the commodity programs during the 1990's program but CIAT should give special attention to adding new commodities such as tropical fruits and vegetables which might have an impact in increasing small farmers income and at the same time help in the improvement of the diet (minerals and vitamins) of the low income farmers.

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APPENDIX

QUESTIONNAIRE

RESPONSE SCHEDULE OF OSU COLLEGE OF AGRICULTURE PROFESSORS

Department: _____

No of Years Associated With This Department: _____

Major Area of Interest: _____

International Experience in Agriculture: (Please circle one)

Central America	> 5	2-5	1-2	< 1	Years
South America	> 5	2-5	1-2	< 1	Years
Africa	> 5	2-5	1-2	< 1	Years
Asia	> 5	2-5	1-2	< 1	Years
OTHER:					

_____

As you know the importance of assessing needs in developing countries is mandatory for the proper development of any research program, especially for an International Agriculture Research Center who's main role is to help in the alleviation of world hunger by improving the quantity and quality of food production.

The purpose of this study is to secure judgments as to how **CIAT** (International Center for Tropical Agriculture) can best implement and improve it's strategic plan for the 1990's.

Your help through responses will be very useful in formulating recommendations for improving the effectiveness of the CIAT's program in the 1990's.

To what extent are you acquainted with the work being accomplished by the International Center of Tropical Agriculture (CIAT).

-----Yes, I know fully.
-----Yes, I am somewhat knowledgeable.
-----Yes, only very little.
-----No, I am not knowledgeable.

Are you familiar with the work of other international centers:

WARDA:	Yes	**IBPGR:**	Yes	**ICARDA:**	Yes	**ICRISAT:**	Yes
ILRAD:	Yes	**IFPRI:**	Yes	**CIMMYT:**	Yes	**IRRI:**	Yes
IITA:	Yes	**ILCAD:**	Yes	**ISNAR:**	Yes	**CIP:**	Yes

RESPONSE KEY:
4= VERY MUCH "KNOWLEDGEABLE"
3= VERY "KNOWLEDGEABLE"
2= MODEATELY "KNOWLEDGEABLE"
1= SLIGHTLY "KNOWLEDGEABLE"

To what extent are you knowledgeable of the following commodities?.

CASSAVA:	**4**	**3**	**2**	**1**	None	MAIZE:	**4**	**3**	**2**	**1** None
RICE:	**4**	**3**	**2**	**1**	None	BEANS:	**4**	**3**	**2**	**1** None
BEEF:	**4**	**3**	**2**	**1**	None	OTHER/S:				

I. **Relative Importance**. (a) **Select areas**.

Any dynamic institution must continually change to meet changing circumstances. This is particularly true of international research organizations they must respond to new opportunities and increasing knowledge to meet the challenge of food production in the developing countries.

What type of research should CIAT use as an effective tool to overcome the Latin American problems? (CIAT is an institution capable of any of these types of research).

Indicate relative importance according to the following scale:

4= Essential
3= Very Important
2= Moderately Important
1= Slightly Important

Basic Research	**4**	**3**	**2**	**1**	None
Strategic Research	**4**	**3**	**2**	**1**	None
Applied research	**4**	**3**	**2**	**1**	None
Adaptative Research	**4**	**3**	**2**	**1**	None

Areas of particular importance:

Genetic characterization of germplasm to identify gene pools to be used in plant breeding activities. **4 3 2 1** None

Better understanding of the biology, natural control mechanisms and epidemology of the most important diseases and pests of crops. **4 3 2 1** None

Better understanding of plant/soil/water/ microorganisms relationships **4 3 2 1** None

I. Relative Importance. (b) **Priorities**.

One of the goals of an international agriculture research center must be to develop technology that will not only increase production, but do so in a sustained manner without environmental degradation.

According to your judgements what is the extent of importance of CIAT being concerned with?

Excessive Deforestation	**4**	**3**	**2**	**1**	None
Species extinction	**4**	**3**	**2**	**1**	None
Misuse of Chemical Inputs	**4**	**3**	**2**	**1**	None
Inappropriate land Use	**4**	**3**	**2**	**1**	None
Inappropriate Cultural Practices	**4**	**3**	**2**	**1**	None
Excessive Genetic Uniformity of improved varieties.	**4**	**3**	**2**	**1**	None
Germplasm conservation	**4**	**3**	**2**	**1**	None

Should a new activity be added? YES / **NO**

If so, what should its nature and mission be?

I. Relative Importance. (c) **Research Activities.**

RESEARCH / DEVELOPMENT ACTIVITIES.

The need of an integration from the researcher to the field is always needed in developing countries.

To what extent would it be important to create a new institutional entity dedicated to the integration of research to the field for CIAT's mandated commodities?

YES / **NO**

HEADQUARTERS / DECENTRALIZED ACTIVITIES.

Often there is not a **clear understanding** between the international research centers and the national research programs. In your opinion to what extent:

Would it be important to developing countries in the region if CIAT developed closer relationship with national programs and dealt with region-specific problems? **4 3 2 1** None

Would it be important that CIAT increase the scope and degree of decentralization; eg. Working with Tropical Africa and Asia? **4 3 2 1** None

RESEARCH / EDUCATION

Would it be important for CIAT to be involved in extension programs? **4 3 2 1** None

Would it be important to Colombia if CIAT was engaged in educational\training programs such as:

Long Term Educational Programs	**4**	**3**	**2**	**1**	None
Short Term Educational Programs	**4**	**3**	**2**	**1**	None
Technical Training	**4**	**3**	**2**	**1**	None
On-The-Job Training (Learning by Doing)	**4**	**3**	**2**	**1**	None

Would it be important to Colombia and other developing countries if CIAT developed a linkage with agricultural Universities?

Undergraduate	**4**	**3**	**2**	**1**	None
Graduate	**4**	**3**	**2**	**1**	None

Would it be important for CIAT to develop special linkages with Land Grant Universities in the US? **4 3 2 1** None

There is a strong tendency among agriculture research institutions not to invest in economic and rural sociological research.

Would it be important for CIAT to be involved in this type of research? **4 3 2 1** None

II. Priority Areas For The 1990s.

CIAT's concerns for poverty and equity motivate it to focus special attention on low-resource farmers.

As short and long term goals what is the importance of CIAT focusing attention on the following groups and situations:

	SHORT TERM GOALS	LONG TERM GOALS
Marginal farmers in marginal potential areas?	**4 3 2 1**	**4 3 2 1**
Low resource farmers in medium to high potential areas?	**4 3 2 1**	**4 3 2 1**
Medium resources farmers in low to medium potential areas?	**4 3 2 1**	**4 3 2 1**
Medium resources farmers in high potential areas?	**4 3 2 1**	**4 3 2 1**

CIAT's mandated commodities are cassava, rice, beans, and tropical grasses.

To what extent would it be important for CIAT to study new commodities, such as:

Soybeans	**4 3 2 1** None
Vegetables	**4 3 2 1** None
Tropical fruits	**4 3 2 1** None

OTHER/S: (Please list) _____

To what extent would it be **important** for CIAT to increase its research efforts in:

Genetic resources characterization (including "hi-tech" areas such as gene mapping) and documentation?	**4 3 2 1** None
Nonconventional breeding systems?	**4 3 2 1** None
Natural resources management?	**4 3 2 1** None
Integration of pest management?	**4 3 2 1** None
Post harvest technology?	**4 3 2 1** None
Policy research and promotion?	**4 3 2 1** None
On-farm research?	**4 3 2 1** None
Cultural practices?	**4 3 2 1** None

To what extent would it be important for CIAT to increase:

Specialized and advanced degree training?	**4 3 2 1** None
Training of trainers?	**4 3 2 1** None
Training methodology and materials development?	**4 3 2 1** None
Production training?	**4 3 2 1** None
In-country training?	**4 3 2 1** None
Providing leadership in integrating regional cooperation?	**4 3 2 1** None

PROFESSOR COMMENTS

VITA

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Candidate for the Degree of

Master of Science

Thesis: PERCEPTIONS OF A SELECT JURY OF OKLAHOMA STATE UNIVERSITY FACULTY REGARDING AGRICULTURAL RESEARCH NEEDS OF THE INTERNATIONAL CENTER OF TROPICAL AGRICULTURE IN COLOMBIA.

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Biographical:

Personal Data: Born in Cali, Valle, Colombia, August 20, 1957. The son of Humberto and Emilia Villaquiran.

Education: Graduated from Villega's High School, Cali, Valle, Colombia. Received Bachelor of Science Degree in Animal Science from the National University of Colombia in 1985. Completed requirements for the Master of Science degree at Oklahoma State University in July, 1990.

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